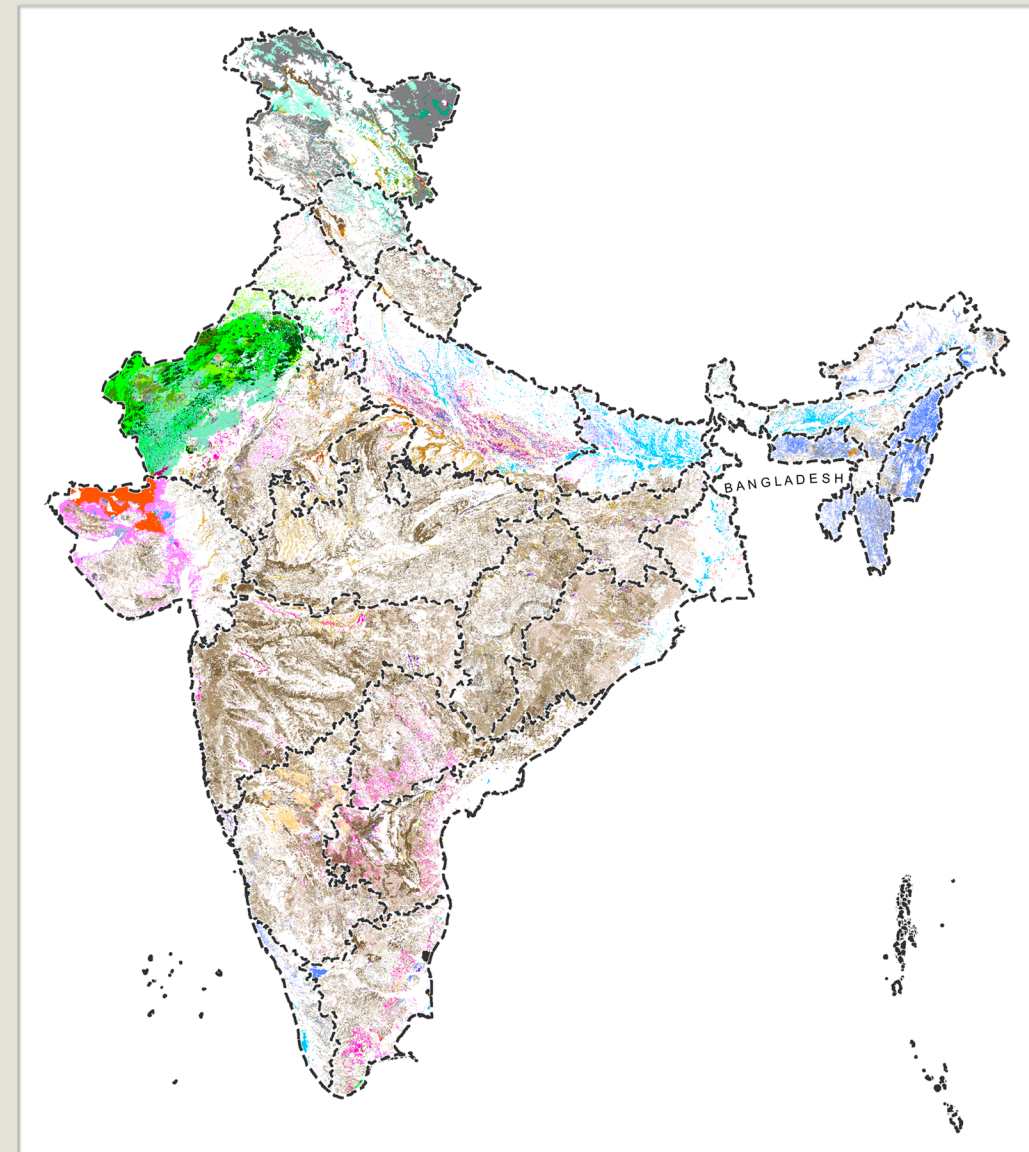
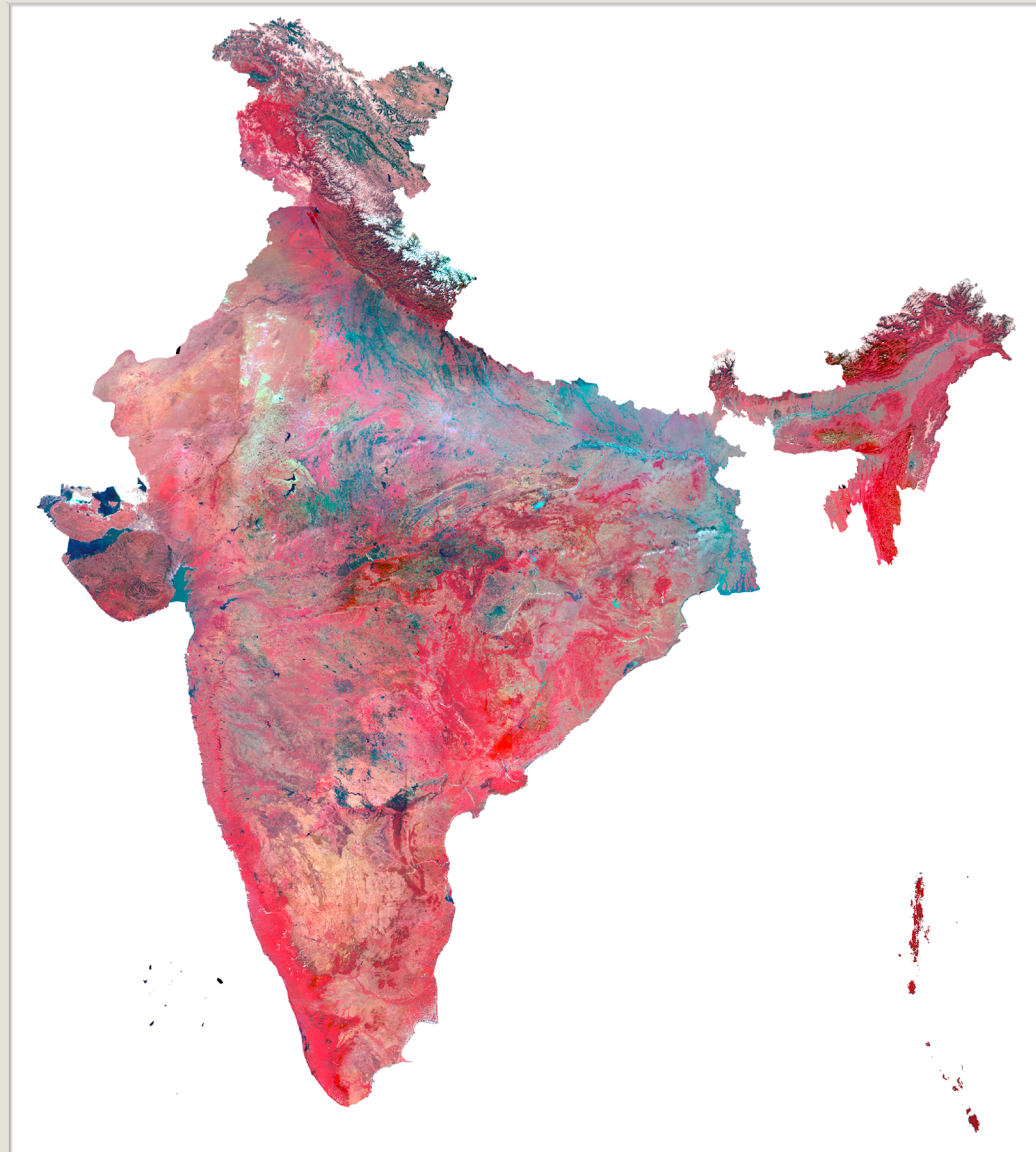


STATUS OF LAND DEGRADATION IN INDIA : 2015 - 16

ATLAS



National Remote Sensing Centre
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nrsc

August, 2019

STATUS OF LAND DEGRADATION IN INDIA : 2015-16

ATLAS



nrsc

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August, 2019

Citation:

National Remote Sensing Centre, ISRO, 2019.

STATUS OF LAND DEGRADATION IN INDIA : 2015-16

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National Remote Sensing Centre

ISRO, Govt. of India

Hyderabad

Page makeup, Design and Printed at Map Printing Facility, PPEG, NRSC, Hyderabad

NATIONAL REMOTE SENSING CENTRE

DOCUMENT CONTROL SHEET

01.	Security Classification	Controlled Document			
02.	Distribution	General Circulation			
03.	Document Version	(a) Issue no. 01	(b) Revision & Date	R-3, 20-08-2019	
04.	Document Type	Technical Report			
05.	Document Control Number	NRSC-RSA-LRUMG-SLRAD-FEB2019-TR-0001241-V1.0			
06.	Title	STATUS OF LAND DEGRADATION OF INDIA : 2015-16			
07.	Particulars of Collation	Pages 169	Figures 31	Tables 67	References --
08.	Author(s)	Project Team and State wise project team			
09.	Affiliation of Authors	NATIONAL REMOTE SENSING CENTRE			
10.	Scrutiny Mechanism	Compiled By: Soils & Land Resources Assessment Division Dr. K. Sreenivas G. Sujatha Janakirama Suresh Dr. Tarik Mitran	Reviewed By: Dr. T. Ravisankar Group Director, LRUMG	Approved / Controlled By: Dr. P.V.N. Rao Deputy Director, RSA	
11.	Originating Unit	National Remote Sensing Centre, Hyderabad			
12.	Sponsor(s)/Name & Address	ISRO/DOS, Bangalore			
13.	Date of Initiation	April, 2016			
14.	Date of Publication	August, 2019			
15.	Abstract (with Keywords)	Under Natural Resources Census (NRC) programme of ISRO under NNRMS, second cycle of land degradation mapping of the country has been carried out at 1:50,000 scale using temporal Resourcesat-2 LISS-III data of 2015-16 at an interval of 10 years. The first cycle mapping of land degradation was carried out during 2005-06. The present atlas is a State level compilation of status of land degradation during 2015-16. The mapping was carried out in collaboration with various State Remote Sensing centres, Regional Centres, IIRS, and Academia. The land degradation mapping addresses 8 major processes and 36 land degradation classes. The total degraded land in the country has been mapped as 912.07 Lakh ha which is 27.77% of geographical extent of India during 2015-16. During the ten years, there is an overall decrease of around 95,548 ha of land degradation. However, there is a noticeable extent of intra and inter class changes . A national workshop on utilization of natural resources products has been organized on 26th October, 2018 and a draft version of Land Degradation atlas was released. The atlas was finalized based on comments / suggestions received from various users across the country. Keywords: Land degradation, Resourcesat-2, LISS-III, Change detection.			



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FOREWORD

As per Rio convention, every country needs to come out with land degradation status of their country. Satellite Remote Sensing techniques proved time and again their capability to map as well as monitor various natural resources and associated problems. Keeping this in view, ISRO has proactively initiated Land Degradation mapping project under Natural Resources Census program using multi-temporal LISS-III data aboard Resourcesat-2.

In India an estimated 27.8% of total geographical area is under land degradation. Development of these degraded lands is the only viable option to increase food production in India and to meet the requirements of growing population as well as restoring fragile ecosystems. Land degradation neutrality, is attaining paramount importance to compensate for the natural resources requirement ensuring sustainable land management. This effort needs to be supported with thorough technical inputs, effective policies, adequate financial resources, participation of stake holders and a strong institutional mechanism to execute and monitor the efforts. Realising the importance of neutralising land degradation in economical development, India is hosting COP-14 of UNCCD.

Resourcesat based LISS-III sensors data is used for assessment of land degradation and their characterization at district level. The current geospatial database of land degradation generated under this project should be extremely useful for understanding vulnerability of soil resources for degradation, decadal changes in land degradation in the country

and reporting the current status of land degradation to United Nations program on combating desertification. It should also serve as an important input to address the various components of land degradation neutrality. It will also enable planners, administrators and policy makers to initiate appropriate measures for developmental and reclamation activities. Further, the availability of very high spatial resolution data (Cartosat-2E) enables planning, implementation and monitoring of land reclamation efforts at cadastre level.

My compliments to the project team of NRSC and to all those Partner Institutions and individuals, who have contributed to the successful completion of this project. I sincerely hope that the atlas of Land Degradation (2015-16) will prove to be a valuable information for various flagship programmes of Ministries like Agriculture and Farmers Welfare, Rural Development, Panchayat Raj, Tribal Development, Forests Environment and Climate Change of Govt. of India for ensuring land degradation neutrality and food security of the country.

20th August, 2019

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PREFACE

National Remote Sensing Centre, over a period of three decades has developed methodologies to map and monitor various land degradation processes using IRS sensors data. First ever effort to map salt-affected soils using satellite remote sensing on 1:250,000 scale over entire India was initiated by NRSA during mid eighties. This effort culminated in an estimate on salt affected soils of the country at 6.727 million hectares. Subsequently, with the availability of improved spatial resolution data sets, mapping on 1:50,000 scale was accomplished in various irrigation command areas. All these efforts resulted in nationwide land degradation mapping on 1:50,000 scale using multi-temporal Resourcesat LISS-III data under Natural Resources Census program of ISRO / DOS using satellite data acquired during 2005-6.

This has enabled to develop and adopt uniform classification system and interpretation scheme on a common spatial database design across India, addressing eight major land degradation processes. Now, NRSC has carried out another cycle of land degradation assessment using 2015-16 Resourcesat-2 LISS-III data to understand the current land degradation status as well as decadal changes. This task was accomplished by NRSC with active participation from Regional Remote Sensing Centres, NESAC, IIRS, State Remote Sensing Centres, ICAR and Academia.

To accomplish this task, NRSC has brought out a project manual portraying the detailed methodology with necessary quality standards. Training was also imparted to various Partner Institutes and a standard geodatabase was prepared across India.

A national workshop on "Utilization of natural resources products" was conducted on 26th October, 2018 and a draft version of this atlas was hosted on Bhuvan. Further, the land degradation outputs of 2005-06 and 2015-16 will be hosted on Bhuvan portal for visualization and public utility.

I wish this land degradation atlas will be of immense use for various National and State level organizations, NGOs and others involved in conservation of natural resources. I sincerely compliment the whole project team for bringing out this Atlas in a timely manner.

20th August, 2019


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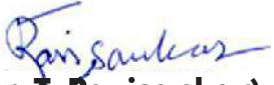
ACKNOWLEDGEMENTS

Natural Resources Census Land Degradation Project Team, wish to place on record deep sense of gratitude to Dr. K. Sivan, Chairman, ISRO and Secretary, Dept. of Space and Sri. A. S. Kiran Kumar, Ex-Chairman, ISRO, for their support and encouragement in carrying out this National level project. We owe our sincere thanks to Sri. Santanu Chowdhury, Director, NRSC and Dr. Y. V. N. Krishna Murthy, former Director, NRSC for their keen interest and guidance during the execution of project. Our sincere thanks are due to Dr. P. G. Diwakar, Director, EDPO, ISRO & former Project Director and Dr. P. V. N. Rao, Dy. Director, RSA & current Project Director in this endeavor.

We are highly grateful to the representatives of various partner institutions from RRSCs, IIRS, NESAC, State Remote Sensing Centers, Indian Council of Agriculture Research (ICAR), Research Organisations and Universities for their active participation in this project whose efforts are culminated into developing a national database of land degradation along with changes occurred in their status during the past decade.

I appreciate the efforts of Scientists of Soils & Land Resources Assessment division, LRUM Group, RSA, NRSC for efficient coordination of project and timely realization of outputs. Acknowledgements are due to internal and external quality teams for checking the quality of the outputs.

I duly acknowledge the support rendered by Map Printing Facility of NRSC for printing this atlas. I also extend my thanks to finance and administration divisions of NRSC for their constant support in providing necessary project management.


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ABBREVIATIONS

DEM	Digital Elevation Model
DOS	Department of Space
FCC	False Colour Composite
ICAR	Indian Council of Agricultural Research
IIRS	Indian Institute of Remote Sensing
IRS	Indian Remote Sensing Satellite
LD	Land Degradation
LDA	Land Degradation Area
LISS	Linear Imaging Self Scanning
LoC	Line of Control
LULC	Land Use and Land Cover
NR Census	Natural Resources Census
NRSC	National Remote Sensing Centre
RRSC	Regional Remote Sensing Centre
TGA	Total Geographical Area

EXECUTIVE SUMMARY

Land degradation (LD) is temporary or permanent impairment of productivity of land through deterioration of physical, chemical or biological aspects. The spatial distribution of various types of land degradation is important for planning reclamation activities and increasing the agricultural production of the country.

The nationwide land degradation mapping has been taken up by ISRO along with partner institutions from State remote sensing centres, ISRO/ DOS centres and academia. The project has been taken up under Natural Resources Census (NRC) program of ISRO for generating information on land degradation at 1:50,000 scale using multi-temporal Resourcesat-1/2 LISS-III data. The endeavour of this magnitude called for adaptation of uniform classification as well as database scheme along with usage of common spatial database for deriving land degradation information.

The first cycle of mapping was carried out using Resourcesat-1 multi-temporal LISS-III data of 2005-06 and the second cycle of land degradation mapping on 1:50,000 scale was now carried out using Resourcesat-2 multi-temporal LISS-III data for 2015-16. The overall approach to map land degradation on 1:50,000 scale is based on visual interpretation using the multi-temporal LISS-III data.

Classification system along with visual interpretation cues, developed during 1st cycle LD mapping (2005-6), were used for visual interpretation of multi-temporal LISS-III data. This was supported by adequate field checks, soil chemical analysis and internal as well as external quality checks at various stages of project execution.

The land degradation processes addressed in this project are water erosion, wind erosion, water logging, salinisation / alkalization, acidification, glacial, anthropogenic and others. For mapping land degradation, nearly 900 LISS-III images acquired during Kharif, Rabi and summer seasons were used. Visual interpretation of multi-season data was supported with knowledge from historic thematic bases like waste lands and land use land cover as well as Cartosat DEM. The maps were finalized with adequate ground truth and soil analytical results of nearly 2900 soil samples collected exclusively under this project. Quality check was carried out for co-registration, cloud cover and radiometry during data generation stage.

The output of the project is an improved LD map of 2005-6 and LD map of 2015-16 along with changes in the land degradation status. The total land degradation area in India is around 912.07 Lakh ha which constitutes 27.77 % of total geographic area (TGA) during 2015-16 period. The major land degradation in India is water erosion (15.53% TGA), followed by wind erosion (4.35 %TGA). Salinisation/Alkalization constitutes around 1.97 % of TGA. The major land reclamation happened in water logged areas, sand dunes and salt-affected areas which were brought under plough. However, sizable extent of normal areas have gone to water erosion and also increase of land degradation due to anthropogenic activities during the 10 years period. Overall net change in land degradation is a decrease of 91,548 ha area during the 10 years period.

A national workshop on **Utilisation of Natural Resources products** was organised on 26th October 2018 and a draft version of Land Degradation atlas was released. The current atlas was finalised based on comments/suggestions received from various users across the country. These outputs showcased in this Atlas should be useful for identification of priority areas for planning various developmental programmes like soil and water conservation, watershed development, prioritization of watersheds, climate change studies, carbon sequestering studies, etc. The land degradation outputs will be hosted on Bhuvan for public visualization.

1. Introduction

India is endowed with vast natural resources. However, it suffers from a variety of problems ranging from population explosion impacting accelerated land degradation. India homes over 16% of world's population in an area, which is 2.42% of global spread. Per Capita arable land in India, which is around 0.15 ha at present, is expected to decrease to a meagre 0.09 ha by 2075.

The natural resources of a country are of primary importance for the development of economic life of its inhabitants and more specifically the soil resources because they are vital resources for growing food, fiber and firewood to meet the human needs. Soils are highly vulnerable to degradation and nature takes very long period (say 300 – 1000 years) to form an inch of the top soil. Because of lack of adequate information on soil resources coupled with improper land use planning resulted in many of the present day land degradation problems in our country such as salinity / alkalinity and waterlogging in command areas, severe erosion in catchments leading to siltation of reservoirs, decrease in productivity of crops etc. For example, the introduction of canal irrigation system in Punjab, Haryana, Rajasthan, Uttar Pradesh, Gujarat, etc., without proper assessment of soil characteristics has resulted in the problems of salinity / alkalinity and waterlogging. Efforts were made by various agencies to identify various types of degraded lands, their spatial extent and severity levels. The first cycle mapping of land degradation was carried out on 1:50,000 scale for year 2005-06 using multi- temporal Resourcesat-1 LISS-III satellite data (first cycle). This exercise gave detailed information on land degradation status and its geographical distribution in the country.

2. Goal

Realizing the need for reliable information on degraded land, and the potential of space-borne multispectral and multi-temporal data inventory and monitoring, a national level land degradation

mapping (2nd cycle) is proposed as part of NR Census programme by Department of Space with the following goal:

To map and monitor the land degradation on 1:50,000 scale for the whole country based on land degradation classification system adopted in the 1st cycle to meet the requirements of the various user agencies for planning reclamation programmes”.

3. Objectives

- To prepare land degradation map for the year 2015-16 using three seasons (Kharif, Rabi, Zaid) IRS LISS- III satellite data,
- To prepare land degradation change map between the base year 2005-06 and 2015-16.
- To prepare updated seamless land degradation digital database for India.

4. Land Degradation Classification Scheme

Land Degradation (LD) classification scheme of 2nd cycle was slightly modified based on the experiences gained from 1st cycle of LD mapping. The major classification scheme being same as first cycle, the land use and landform attributes in the classification scheme of first cycle were dropped in cycle-2. The classification system broadly consists of the following elements:

Land degradation process – 8

Land degradation classes - 36

The land degradation classification scheme adopted in the project is presented as table-1. The attribute table of LD vector layer has LD class of 2005-6 and 2015-16 for each polygon. After updation of vector layers, the attribute table was used to reconstruct 2005-06 and 2015-16 LD maps.

Table 1: Classification scheme for mapping land degradation at 1:50,000 scale

LD Process	LDCODE	LD Class
Water erosion	A1	Sheet - Slight
	A2	Sheet - Moderate
	A3	Sheet - Severe
	A4	Rills
	A5	Gullies
	A6	Ravines - Shallow
	A7	Ravines - Moderately deep to deep
Wind erosion	B1	Sheet - Slight
	B2	Sheet - Moderate
	B3	Sheet - Severe
	B4	Stabilized dunes
	B5	Partially-stabilized dunes
	B6	Un-stabilized dunes
Water logging	C1	Surface ponding -Seasonal
	C2	Surface ponding - Permanent
	C3	Sub - surface Waterlogging
Salinisation/Alkalization	D1	Saline - Slight
	D2	Saline - Moderate
	D3	Saline - Severe
	D4	Sodic - Slight
	D5	Sodic - Moderate
	D6	Sodic - Severe
	D7	Saline Sodic - Slight
	D8	Saline Sodic - Moderate
	D9	Saline Sodic - Severe
	D10	Rann
Acidification	E1	Acidity - Moderate
	E2	Acidity - Severe
Glacial	F1	Frost heaving
	F2	Frost shattering
Anthropogenic	G1	Industrial-effluent affected areas
	G2	Mining & dump areas
	G3	Brick kiln areas
Others	H1	Mass movement / Mass wastage
	H2	Barren rocky/ Stony waste
	H3	Miscellaneous-Riverine sands / Sea ingress areas
Normal	N	Normal

Note: Excluding all natural wetlands, marshes, mangroves, jheels, tals, etc. & areas where water is ponded intentionally for life saving irrigation

5. Description of Land Degradation Types

Explanation of different land degradation categories and descriptions of various categories of land degradation are given below:

5.1. Water erosion (A)

Water erosion is the most widespread form of degradation and occurs widely in all agro-climatic zones. The displacement of soil material by water can result in either loss of topsoil or terrain deformation or both. This category includes processes such as splash erosion, sheet erosion, rill and gully erosion. The soil erosion is initiated when raindrops fall onto the bare soil surface. The impact of raindrops breaks up the surface soil aggregates and splashes particles into the air. On sloping land, relatively more of the detached material will be carried away along with runoff. This subsequently leads to different types of water erosion depending on the gravity of the problem, susceptibility of land and continuity of the process.

5.1.1. Sheet erosion (A1/A2/A3)

It is a common problem resulting from loss of top soil. The loss of top soil is often preceded by compaction and/or crusting, resulting in a decrease of infiltration capacity of the soil. The soil particles are removed from the whole soil surface in the form of thin layers. The severity of the problem is often difficult to visualize with naked eyes in the field. Depending on the magnitude of soil loss, it has 3 severity classes, A1, A2 and A3 with soil loss of 10-20, 20-40 and >40 tons/ha/year soil loss respectively.



Sheet erosion- Slight

Sheet erosion – Severe

5.1.2. Rills (A4)

When the surface runoff goes in the form of a concentric flow, tiny water channels are formed in the field. These are small finger shaped rivulets of such a size that they can be worked over with farm machinery. Rills are generally associated with the cultivated lands and are visible in the ploughed soil after first heavy showers. One important feature of rills is that they do not occur at the same

place repeatedly. This is a temporary concentric flow of runoff, which could vanish after ploughing the land.

5.1.3. Gullies (A5)

Gullies are formed as a result of localized surface run-off affecting the unconsolidated material resulting in the formation of perceptible channels causing undulating terrain. If rills are neglected and the erosion continues for a long time, it develops in to gullies. They are commonly found in sloping lands, developed as a result of concentrated run-off over fairly long time. They are mostly associated with stream courses, alluvial soils with soil erodability, sloping grounds with good rainfall regions and foothill regions. These are the first stage of excessive land dissection followed by their networking which leads to the development of ravinous land.



Gully erosion

5.1.4. Ravines (A6 /A7)

The word ravine is usually associated not with an isolated gully but an intricate network of gullies formed generally in deep alluvium and entering a nearby river, flowing much lower than the surrounding tablelands. Ravines are basically extensive systems of gullies developed along river courses. Further classification of this category is possible based on the depth, width, bed slope, frequency and morphology of bed material of the ravines. Based on the depth of the ravines, which has a characteristic manifestation on the satellite image, two sub-categories were delineated viz., shallow ravinous and deep ravinous lands.



Ravines

5.2. Wind erosion (B)

It implies uniform displacement of topsoil by wind action. It can result in loss of topsoil and the deposition of the eroded material elsewhere which leads to formation dune complexes. The risk of wind erosion is severe in the arid and semi-arid areas. It includes both the removal and deposition of soil particles by wind action and the abrasive effects of moving particles as they are transported. Not only the wind can remove topsoil from good farmland; it can result in additional damage by burying land, buildings, machinery, etc. with unwanted soil. It occurs when soil is left devoid of vegetation, either because of poor rainfall or loss of vegetation due to overgrazing. In the sand deposited areas, the dunes get stabilized partially or fully depending on vegetal cover it establishes.

During high winds the finer soil particles are swept high in the air and sometimes carried for great distances as dust storms; while coarser particles will roll or swept along. The wind erosion process is highly dynamic and requires careful evaluation of the site and process.

5.2.1. Sheet erosion (B1/B2/B3)

It implies uniform displacement of topsoil by wind action as thin layers / sheets. During wind storms, the dry fine to medium soil particles will suspend into air will be transported to longer distances, while the heavier particles creeps on the surface and generally will be transported to a shorter distances. The uneven displacement of soil material by wind action leads to deflation hollows and dunes. The lifted soil particles may reduce the productivity of adjacent fertile land when they are deposited in the form of sand castings.



Sheet erosion-wind

5.2.2. Stabilized dunes (B4) / Partially stabilized dunes (B5)

Depending on the rainfall and protection available from grazing, the bare sand dunes gradually establishes vegetal cover thus making them to get stabilized. In partially stabilized dunes, the erosion / deposition will still be active to some extent. When they establish a good vegetal cover either in the form of grasses, shrubs and scrubs, they get stabilized and erosion / deposition activity will become minimal. By virtue of vegetal cover and physiography, they are discernible on satellite imagery.



Partially stabilized dunes

5.2.3. Un-stabilized dunes (B6)

Due to their inherent vulnerability due to lack of vegetal cover, the wind erosion is quite active during summer season in these areas. The sand starts moving and engulfing the adjoining agricultural lands, engineering structures and demands immediate attention for their stabilization. The unstabilized sand dunes changes their location and shape from season to season and hence they are often called shifting dunes.



Un-stabilized dunes

5.3. Water logging (C)

Water logging is considered as physical deterioration of land. It is affected by excessive ponding / logging of water for quite some period and affects the productivity of land or reduces the choice of taking crops.

5.3.1. Surface ponding (C1/C2)

This category addresses the water logging caused by flooding of river water, submergence by rainwater and human intervention in natural drainage systems that adversely affect the natural drainage, where the water stagnates for quite a long time. Depending the number of crops it affects, it has been sub-divided into two severity classes, seasonal- affecting one crop and permanent - affecting more than one crop. Though flooding of paddy fields is not included in general, low lying areas and lower elements of slope where the farmers do not have any alternative choice except for growing paddy, were however included as waterlogged. These areas manifest in post-monsoon data, especially during *rabi* season. Waterlogging may be seasonal or permanent. Seasonally waterlogged areas are those low lying areas that get saturated due to heavy rains and become normal areas in post-monsoon season. Permanent waterlogged areas are those areas where there is a continuous surface ponding of water or soil profile is saturated for one or more seasons.



Surface ponding

5.3.2. Sub-surface water logging (C3)

If the water table is within 2m from the surface it adversely affects crop by virtue of saturating the root zone due to capillary rise. These areas are potential threat to get surface ponded in due course of time, if the water accumulation continues. The sub-surface waterlogged areas can be reclaimed with little ease.

5.4. Salinization / Alkalization (D)

5.4.1. Saline/ Sodic/ Saline Sodic(D1-D9)

These are the lands suffering with accumulation of soluble salts there by affecting the crop growth. Based on the type of salt problem, it has been divided into saline, sodic and saline-sodic. The soils with EC more than 2ds/m in black soils and >4ds/m in non-black soils is considered as saline (D1-D3) in the present project. Soils with soil pH more than 8.5 as a result of increase of exchangeable sodium percentage in soils (> 15) and are termed as sodic (D4-D6). Soil having both high EC and pH>8.5 are termed as saline-sodic soils. The criteria for assessing saline as well as sodic soil are given table-2.



Salinization

Table 2: Criteria for assessing salinity / sodicity in Black soils / Non-Black soils

S.No	Severity Class	Salinity (dS / m)		Sodicity (ESP)	
		Black soils	Other soils	Black soils	Other soils
1.	Slight	2 - 4	4 - 8	5 - 10	15 - 40
2.	Moderate	4 - 8	8 - 16	10 - 20	40 - 60
3.	Severe	> 8	> 16	> 20	> 60

S = Saline, N = Sodic, SN = Saline-Sodic.

S. No	Type	Classes included		
		Slight	Moderate	Severe
1	Saline	S1	S2	S3
2	Sodic	N1	N2	N3
3	Saline-Sodic	S1N1	S1N2, S2N1, S2N2	S1N3, S2N3, S3N1, S3N2, S3N3

Note: The sub-categorization of salt-affected soils is based on most limiting factor concept. S1 means Saline-slight, S2N3 means Saline-moderate and Sodic-severe and so on.

5.4.2. Rann (D10)

Rann is an extremely saline area which barely supports any grass. These areas formed due to saline water intrusion and are found in the coastal areas of arid and semi-arid regions. These areas are not arable. Occasionally they support *Prosopis sp.*

5.5. Acidification (E1/E2)

Soil pH is one of the most-important soil property that affects the nutrient uptake by plants and there by influencing the crop productivity. Any soil processes or management practices which lead to build-up of hydrogen cations (also called protons) in the soil will result in soil acidification. It also occurs when base cations such as Calcium, Magnesium, Potassium and Sodium are lost from the soil leading to high hydrogen ion concentration. This results in decrease of soil pH below 6.5. It occurs in laterite regions, coastal regions upon drainage or oxidation of pyrite containing soils. If the pH is 4.5 to 5.5 then they are called *moderate* and if the pH is < 4.5, then they are mapped under *severe* category. The soils respond to lime application, which results in improvement of crop productivity.



Acidic soil

5.6. Glacial (F)

These are the areas under perpetual snow covered areas found in Himalayan region. The types of degradation included are frost heaving and frost shattering.

5.6.1. Frost heaving (F1)

Frost heaving is defined as a process in glacial and periglacial environment where intense frost action and freezing of water evolves peculiar forms of rock, regolith and soil. The water crystallizes to ice below the surface horizon leading to micro-relief variations on the surface. This process affects the germination and root growth of several crops there by limiting the productivity of land.



Frost heaving

5.6.2. Frost shattering (F2)

Frost shattering is defined as a freeze and thaw actions operating mostly in periglacial environment. When water that filters through the crevices and pores in rock freezes, it expands by almost by ten times. This puts enormous pressure on the rocks resulting in its breaking down. This process is very active in areas adjoining glacial margins with long cold winters and short mild summers in periglacial environment.



Frost shattering

5.7. Degradation due to anthropogenic factors (G)

Human economic activities like mining, industries etc., have also contributed to decreased biological productivity, diversity and resilience of the land. Mining, brick kiln activities and industrial effluent affected areas are included under this type of degradation.

5.6.3. Industrial effluent affected areas (G1)

These are areas where the human activity is observed in the form of industry along with other supporting establishments of maintenance. Heavy metallurgical industry, thermal, cement, leather, petrochemical, engineering plants etc., are included under this. These are the lands which have been deteriorated due to large scale industrial effluent discharge. These areas are seen around urban areas and other areas where industrial activity is prominent.



Industrial effluent affected area

5.6.4. Mining and dump areas (G2)

These are the areas subjected to removal of different earth material (both surface and sub-surface) by manual and mechanized operations. Large scale quarrying and mechanizations results in mining and mine dumps. It includes surface rocks and stone quarries, sand and gravel pits, etc. Mine dumps are those areas where waste debris is accumulated after extraction of required minerals. Generally these lands are confined to the surroundings of the mining area.



Mining

5.6.5. Brick kiln areas (G3)

These areas are associated with human activity and are generally seen in the vicinity of urban activity. The areas include brick kiln per se and area dug for making bricks.



Brick kiln

5.7. Others (H)

Some of the degraded lands, which could not be included in the above type of land degradation, are included here. They are mass movement/ mass wastage, barren rocky / stony waste areas.

5.7.1. Mass movement/ Mass wastage (H1)

Landslide areas are mostly included under mass movement/ mass wastage type of land degradation. This class also includes the areas with mass wastage in terms of foothill depositions like scree and bazada zones, where the coarse material like sand and pebbles gets deposited because of erosion in upper catchment area.



Mass movement

5.7.2. Barren rocky / stony waste areas (H2)

Barren / rocky / stony areas are the rock exposures of varying lithology often barren and devoid of soil and vegetal cover. They occur in hills as openings or as isolated exposures on plateau and plains. These can be easily delineated from other type of degraded land because of their severe nature of degradation and typical spectral signature.



Barren rocky

5.7.3. Miscellaneous (H3)

This includes riverine sand areas, sea ingressión areas mainly with sand deposition excluding the sandy areas of desert region.

6. Methodology

The methodology essentially involves geo-rectification of satellite data, design and development of geo-database with uniform schema, delineation and updation of land degradation categories through on-screen visual interpretation, ground truth collection, soil chemical analysis, finalization of land degradation polygon boundaries, quality checking, area estimation and statistics compilation.

Multi-temporal ortho-rectified LISS-III data acquired during Kharif, Rabi and Zaid season of 2015-2016 was used as satellite database for interpretation and updation of land degradation. The satellite data was geometrically and radiometrically corrected and was provided to partner institutes along with land degradation vector data prepared in first cycle (2005-06). Besides, topographic maps, existing land use land cover, wasteland and salt-affected soil maps, DEM were also used as reference. The methodology flow chart is presented in fig-1.

Methodology consists of following steps:

- Orthorectified Resourcesat LISS-III data of 2015-16 covering Kharif (Aug –Nov), Rabi (Jan- Mar), Zaid (April- May) seasons was used to address spatial and temporal variability in land degradation.
- The methodology of the study was on-screen visual interpretation of different land degradation classes on satellite data FCC following standard visual interpretation techniques using the interpretation cues and classification scheme provided in manual.
- The cycle-1 (2005-06) land degradation vector layer was overlaid on to the orthorectified images of 2015-16. Based on visual analysis of multi temporal (three season viz. Kharif, Rabi and Zaid) 2015 –16 satellite data and available field information, the changes in land degradation classes were updated in 2005-06 layer to derive 2015-16 land degradation map.
- This was followed by labeling the polygons with appropriate LD change categories.
- Sample points were identified for various land degradation classes as per sampling scheme.
- Field information was collected as per the ground truth formats provided in project manual.
- Soil samples were collected, wherever required, processed and analyzed for chemical properties in the analytical laboratory.
- The preliminarily interpreted land degradation map were finalized in light of ground truth data and soil analytical data (wherever done) to arrive at the final map. Existing legacy spatial data of on forest cover, wastelands, salt affected soils, biodiversity, land use / land cover etc. were also referred during map finalization.
- The minimum mapping polygon size of 3 mm x 3 mm on 1:50,000 scale equivalent to 2.25 ha area, were retained except for significant classes like brick kilns, where even smaller than 2.25ha were also retained.
- A two tier quality checking (QC) mechanism was adopted in this project viz., Internal QC (IQC) and External QC (EQC). The IQC team essentially comprises of experts available within the partner institute, while EQC team comprises of experts drawn from NRSC / IIRS / RRSC's. While IQC team checks the entire mapping process, EQC team checks 10% of the area randomly. Besides a cursory overall QC was also carried out by EQC team.
- Entire data was organized as geodatabase for proper organization and retrieval along with appropriate metadata.
- National, State and District-wise land degradation area statistics were generated.

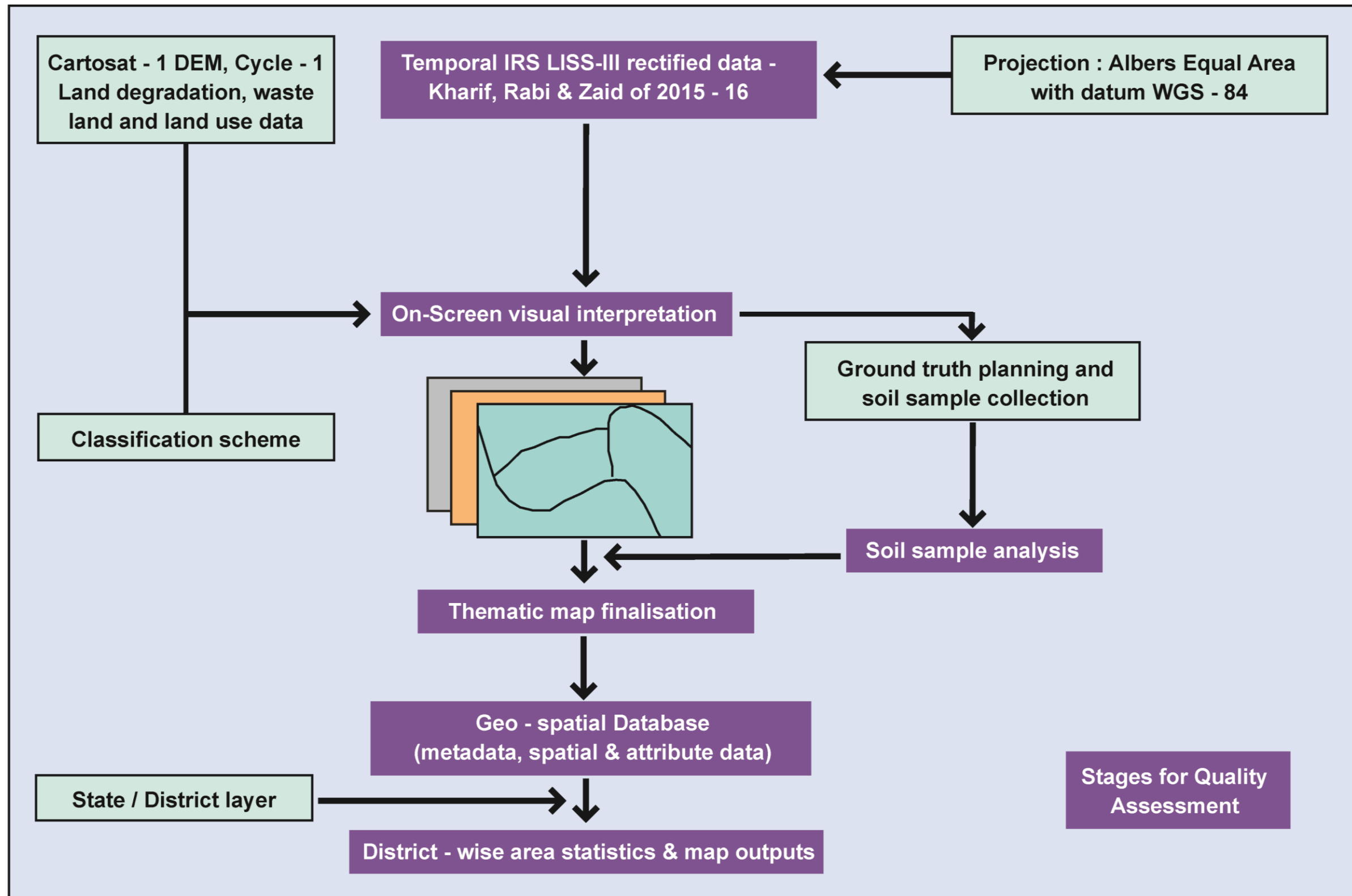


Fig.1 Overview of the methodology

7. Spatial distribution of land degradation

The extent of land degradation and their decadal changes were generated state as well as district wise. They are presented in table 3 to 67. The land degradation maps of various states have been appended as Fig. 3 to 31.

7.1. Land degradation status during 2005-2006

The overall status of land degradation in India, as per 2005-06 assessments appended as table 3, 4 and 6. During 2005-06, about 912.98 Lakh ha of land is under various processes of land degradation in India. Water erosion is the major process involved in land degradation in India, accounting to 55.88% of total land degradation and 15.53% of total geographical area of India. This is followed by wind erosion accounting to 15.77% of total land degradation in India or 4.38% of TGA. The Salinization / alkalization (comprising various categories like saline, sodic and saline-sodic and Rann) is spread over 65.19 Lakh ha, accounting to 7.14% of total land degradation. Acidification is spread over 30.46 Lakh ha (3.34% of total land degradation) and this spatial extent excludes paddy lands, dense forest, and plantations. The barren rocky, mass movement and riverine sands (others category) accounts to 12.15% of total land degradation (3.38 % of TGA).

Out of all the States, Rajasthan has maximum extent of land degradation extending over 181.52 Lakh ha accounting to 19.88% of total land degradation of the country. It is closely followed by Maharashtra with 110.18 Lakh ha land under land degradation accounting 12.06% of total land degradation (Table 3 & 4). The major process operating in Rajasthan is wind erosion followed by water erosion. In Maharashtra the major land degradation process is water erosion followed by Salinization / alkalization.

7.1.1. Land degradation class-wise distribution

Water erosion is found to be the dominant process in majority of the States, especially in central plateau region of India. It is maximum in Maharashtra followed by Odisha and Madhya Pradesh.

In north eastern States like Nagaland, Manipur, Meghalaya, Mizoram, Tripura and Arunachal Pradesh, acidification process is dominant. Wind erosion is predominant in arid regions of India. It is mostly occurring in Rajasthan (hot desert) as a dominant process followed by Jammu & Kashmir (cold desert) and Haryana. It is also observed to a lesser extent in Tamil Nadu, Punjab, Andhra Pradesh, Gujarat and Odisha in decreasing order of area.

Water logging is found to be maximum in Bihar followed by Uttar Pradesh and Assam. It is observed to a lesser extent in Himachal Pradesh, Madhya Pradesh, Uttarakhand, Tripura, Meghalaya, Jharkhand, Goa, Manipur, Jammu and Kashmir, Karnataka and Telangana in increasing order of area. However this LD process is not found in the States of Chhattisgarh, Maharashtra, Mizoram, Nagaland, Sikkim.

Salinisation/ Alkalisiation is found extensively in Gujarat (4.2% of total land degradation) followed by Uttar Pradesh (0.66%) and Rajasthan (0.59%). In Gujarat, it is mainly due to saline water intrusion. There is a significant extent of this process occurring in Andhra Pradesh, Tamil Nadu, Telangana, Maharashtra, Bihar, Karnataka, Haryana, Jammu & Kashmir, Madhya Pradesh, Punjab and Odisha, in decreasing order of area.

Acidification is mostly occurring in Nagaland, Manipur, Mizoram, Meghalaya, Arunachal Pradesh, Tamil Nadu, Tripura, Assam, Kerala, Karnataka, Odisha and Maharashtra in decreasing order of total area. This is mostly confined to the high rainfall regions which mainly formed due to leaching of alkaline salts to lower depths.

Glacial Process, as name suggests, is found to be occurring in cold desert area namely Jammu Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh. The dominant degradation type is frost shattering followed by frost heaving.

The extent of land degradation due to anthropogenic activities is found maximum in Karnataka, Rajasthan and Andhra Pradesh followed by Telangana. Other land degradation processes such as barren rocky, mass movement and riverine sand is observed to a maximum extent in Jammu and Kashmir, Rajasthan followed by Gujarat.

7.2. Land degradation status during 2015-2016

The overall status of land degradation in India, as per 2015-2016 assessments appended as table-3, 5 & 6. About 912.07 Lakh ha of land is under various processes of land degradation in India. The land degradation map of India for 2015-16 has been appended as Fig-2. Water erosion is the major category of land degradation in India accounting to 509.96 Lakh ha which is 55.91% of total land degradation and 15.53% of total geographical area of India. This is followed by wind erosion (142.8 Lakh ha) contributing to 15.66% of total land degradation in India and 4.35% of TGA. The salinisation / alkalization is spread over 646.46 Lakh ha accounting to 7.09% of total land degradation. Acidification is spread over 304.15 Lakh ha (3.33% of total land degradation) and this spatial extent is excluding paddy lands and dense forest areas as well as plantations. Water logging is spread over an area of 182.18 Lakh ha accounting to 2.00% of total land degradation. The glacial process consisting of frost shattering and frost heaving covers an area of 288.39 Lakh ha which is 3.16% of total land degradation and 0.88 % TGA. The anthropogenic process which includes Industrial affluent areas, Mining and dumps and Brick kilns extends in an area of 6.55 Lakh ha accounting to 0.72% of total land degradation in the country. The barren rocky, mass movement and riverine sands (others category) accounts to 12.13% of total land degradation (3.37 % of TGA).

Out of all the States, Rajasthan has maximum extent of land degradation of 180.34 Lakh ha accounting to 19.77% of total land degradation of the country. It is closely followed by Maharashtra with 109.93 Lakh ha land under land degradation (12.05% of total land degradation of India)(Table 3). The major process operating in Rajasthan is wind erosion followed by erosion by water while the major land degradation process in Maharashtra is water erosion followed by salinisation/alkalization.

7.2.1 Land degradation class-wise distribution

Water erosion is found to be dominant process in majority of the States. It is found to a maximum extent in Maharashtra (106.13 Lakh ha) followed by Odisha (58.33 Lakh ha) and Madhya Pradesh (56.30 Lakh ha).

Wind erosion is predominant in arid regions of India and found to be occurring over 138.05 Lakh ha in Rajasthan (hot desert) as a dominant process followed by Jammu & Kashmir (cold desert) and Haryana.

Water logging is found to be maximum in Bihar (7.11 Lakh ha) followed by Uttar Pradesh (4.45 Lakh ha) and Assam (2.68 Lakh ha), whereas it is not observed in the States of Chhattisgarh, Maharashtra, Mizoram, Nagaland, Sikkim. It is observed to a lesser extent in Himachal Pradesh, Madhya Pradesh, Uttarakhand, Meghalaya, Tripura, Jharkhand, Goa, Jammu and Kashmir, Manipur, Karnataka, and Telangana in increasing order of area.

Salinisation/ Alkalisiation is a process found extensively in Gujarat (4.16% of total land degradation) followed by Uttar Pradesh (0.66%) and Rajasthan (0.58%). There is also significant extent of this process occurring in Andhra Pradesh, Tamil Nadu, Telangana, Maharashtra, Karnataka, Bihar, Haryana, Jammu & Kashmir, Madhya Pradesh, Punjab, Odisha, and Goa in decreasing order of area.

Acidification process is dominant in Nagaland (7.43 Lakh ha) followed by Manipur, Mizoram, Meghalaya, Arunachal Pradesh, Tamil Nadu, Tripura, Assam, Kerala in decreasing order of total area. This is mostly confined to high rainfall regions and is formed due to leaching of alkaline salts to lower depths.

Glacial Process is found mostly in cold desert areas of Jammu Kashmir (18.87 Lakh ha), Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh. The dominant degradation type is frost shattering as compared to frost heaving.

The extent of land degradation due to anthropogenic activities is found maximum in Rajasthan, Karnataka, Andhra Pradesh, Telangana, Maharashtra followed by Jharkhand, Madhya Pradesh and Chhattisgarh. Other land degradation processes such as barren rocky, mass movement and riverine sand is observed maximum in Jammu and Kashmir and Rajasthan followed by Gujarat.

7.3. Decadal Changes in land degradation status

The area under land degradation in India during 2005-06 is 912.98 Lakh ha. However it is reduced marginally to 912.07 Lakh ha during 2015-16. The change analysis between first and second cycle of land degradation revealed that there is an overall decrease in land degradation to a tune of 91,548 ha (0.03% of TGA of the country) during ten years span (Table 7&8). The decreases observed mainly in States of Rajasthan, Gujarat and Haryana. A major increase in land degradation is observed in States of Mizoram, Assam, Arunachal Pradesh, Bihar, Manipur, Nagaland and Meghalaya. It is also noticed that the changes are not only from normal class to other LD classes or vice versa but also within the classes of the same LD process and between different LD processes. The decadal changes in LD processes were summarized in table-7. The major decadal changes observed in land degradation classes are given as positive and negative changes in table-8.

It is observed that during these 10 years, around 5,45,295 ha of LD area is converted to normal owing to reclamation and soil conservation measures. The conversion of LD areas to normal is observed in water erosion (2,41,205 ha) followed by wind erosion (1,19,370 ha), Water logging (1,02,815 ha) and salinity (70,000 ha) areas. Majority of such changes are found in the States of Rajasthan, Odisha, Haryana, Gujarat, Maharashtra, and Madhya Pradesh. The changes from water-logging areas to normal could be due to improved drainage conditions and less rainfall during 2015-16.

During this ten year period an area of 4,60,331 ha of normal land is degraded. Among the processes water erosion contributes to the maximum (2,73,926 ha) towards such changes followed by anthropogenic activities (89,281 ha) and water logging (82,131 ha). Such changes are found in the States of Mizoram, Odisha, Assam, Bihar and Arunachal Pradesh.

In the States of Rajasthan, Jharkhand, Punjab and Odisha the normal areas are converted to degraded land due to anthropogenic activities. Areas under water logging during 2005-6 in Haryana, Kerala, Gujarat, Assam and Punjab have been changed to normal land, while in Bihar, Assam, Haryana and West Bengal normal lands became waterlogged in 2015-16.

It is observed that majority of the area under water erosion is converted to mining and brick kilns in the States of Madhya Pradesh, Maharashtra, West Bengal, Chhattisgarh, Odisha, Andhra Pradesh, Jharkhand and Telangana in decreasing order of area.

Water logged areas are converted to saline patches, in parts of Haryana, Uttar Pradesh, Gujarat and Punjab. The areas covered by sand dunes are changed to normal in parts of Rajasthan and Haryana. This due to the areas is brought under irrigation for crop cultivation.

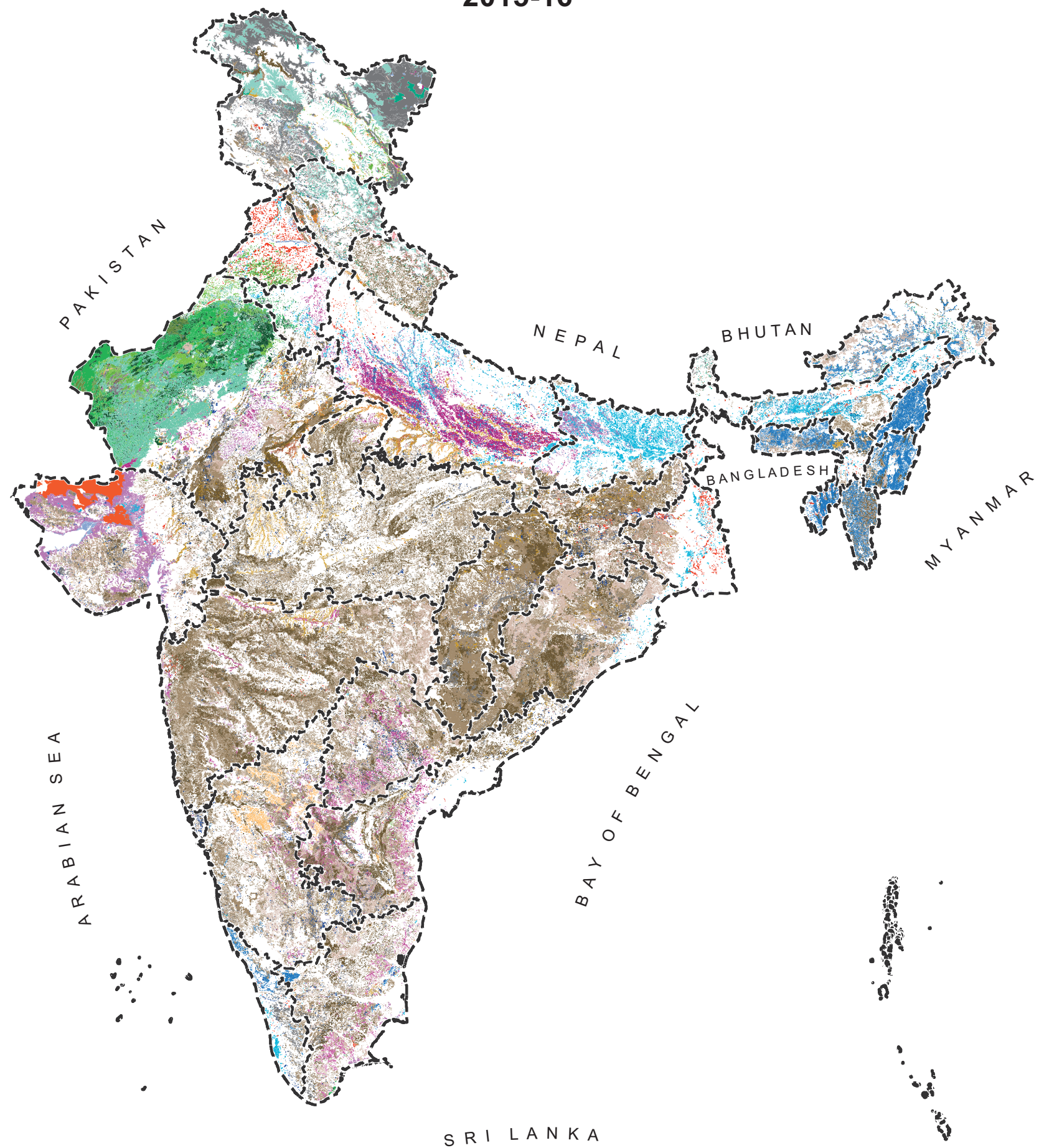
The positive changes observed are from partially stabilized /unstabilized dunes to stabilized dunes (4,39,210 ha) followed by water erosion-sheet erosion-severe / rills to water erosion-moderate (4,18,631 ha) and Water erosion to normal (2,19,165 ha). The major negative change observed is from water erosion-sheet erosion moderate to water erosion-sheet erosion-severe (3,14,158 ha).

7.3.1 Interpretation of LD change matrix table

The land degradation changes in 2015-16 compared to the base year 2005-06 is given in change matrix tables.

- In LD change matrix table, columns indicate land degradation status during 2015-16
- Rows of LD change matrix table indicate land degradation status during 2005-06
- The diagonal cells which has same LD class name in both row and column indicate no change in land degradation during 2015-16 when compared with LD 05-06 and it is represented by black color.
- Summation of all the classes of LD during 2005-06 is given in column named “Class Total (2005-06)” and summation of all the LD classes during 2015-16 is given in row named “Class Total 2015-16”
- The column named “Total LD area during 2005-06” indicates the summation of all the elements given under column “Class Total (05-06)” excluding row ‘N’ which indicates Total degraded land during 2005-06.
- The row named “Total LD area during 2015-16” indicates summation of all the elements given in row “Class Total (15-16)” excluding column ‘N’ which indicates the total degraded land during 2015-16
- Green color denotes change of LD class to Normal from 2005-06 to 2015-16 which represents the decrease in land degradation in 2015-16
- Red color denotes changes from Normal in 2005-06 to land degradation in 2015-16 which indicates increase in land degradation in 2015-16
- Blue color indicates inter-class LD changes during the decade (from 2005-06 to 2015-16).

LAND DEGRADATION MAP OF INDIA
2015-16

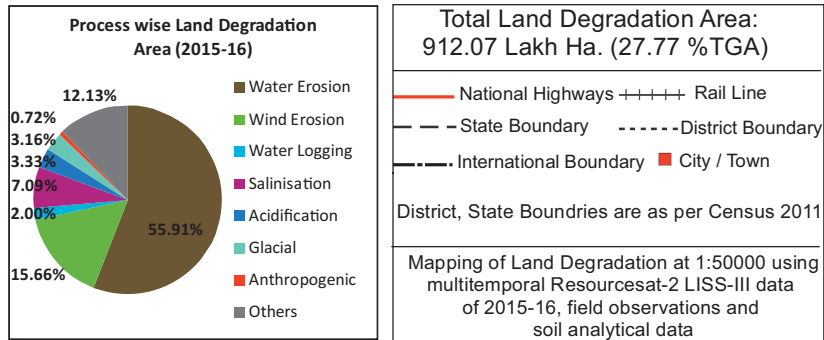


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S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		9244007
2		A2	Sheet erosion - Moderate		24001733
3		A3	Sheet erosion - Severe		14064059
4		A4	Rills		1145902
5		A5	Gullies		1818395
6		A6	Ravines-Shallow		419440
7		A7	Ravines-Deep		302764
8	Wind Erosion	B1	Sheet erosion - Slight		5555988
9		B2	Sheet erosion - Moderate		1069226
10		B3	Sheet erosion - Severe		1046331
11		B4	Stablized Dunes		2590597
12		B5	Partially Stablized Dunes		3610287
13		B6	Un-Stablized Dunes		407317
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		1689202
15		C3	Subsurface waterlogged		132593
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		2668404
17		D4-D6	Sodic - Slight/Moderate/Severe		1085456
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		976047
19		D10	Rann		1734701
20	Acidification	E1/E2	Acidic - Moderate/Severe		3041478
21	Glacial	F1	Frost heaving		325129
22		F2	Frost Shattering		2558729
23	Anthropogenic	G1	Industrial effluent affected areas		51125
24		G2	Mining and dump areas		518039
25		G3	Brick kiln		85627
26	Others	H1	Mass movement / mass wastage		475211
27		H2	Barren rocky / Stony waste		10114507
28		H3	RiverineSands/Sea Ingress etc		474355

Note: White colour in map indicates either no apparent degradation or normal land.



Process wise % TGA of Land Degradation			
Process	Area in L ha	% TGA	% LDA
Water Erosion	509.96	15.53	55.91
Wind Erosion	142.80	4.35	15.66
Water Logging	18.22	0.55	2.00
Salinisation	64.65	1.97	7.09
Acidification	30.41	0.93	3.33
Glacial	28.84	0.88	3.16
Anthropogenic	6.55	0.20	0.72
Others	110.64	3.37	12.13
Total	912.07	27.77	100.00

Project Execution

Soils and Land Resources Assessment
Division, LRUMG, RSA-A,
National Remote Sensing Centre,
ISRO, Dept. of Space, Govt. of India
Hyderabad-500037

Partner Institution(s)

State Remote Sensing Centres, North Eastern Space
Application Centre, Indian Institute of Remote Sensing,
and Academic Institutions.

Table 3: State-wise distribution of land degradation in India (ha)

Sl.No.	State	LDA		TGA	%TGA	
		2015-16	2015-16		2015-16	
1	Andhra Pradesh	5521051	5510756	16020000	34.46	34.40
2	Arunachal Pradesh	940726	982861	8374300	11.23	11.74
3	Assam	697103	741417	7843800	8.89	9.45
4	Bihar	1153674	1191678	9417100	12.25	12.65
5	Chhattisgarh	3630988	3629953	13519400	26.86	26.85
6	Goa	42548	43081	370200	11.49	11.64
7	Gujarat	6054571	5988898	19602400	30.89	30.55
8	Haryana	453299	389221	4421200	10.25	8.80
9	Himachal Pradesh	1279960	1279841	5567300	22.99	22.99
10	Jammu & Kashmir	10272373	10272838	22223600	46.22	46.22
11	Jharkhand	1311694	1319776	7970600	16.46	16.56
12	Karnataka	5270324	5270205	19179100	27.48	27.48
13	Kerala	328842	297536	3886300	8.46	7.66
14	Madhya Pradesh	5946576	5909442	30825200	19.29	19.17
15	Maharashtra	11017822	10992906	30769000	35.81	35.73
16	Manipur	837056	854998	2232700	37.49	38.29
17	Meghalaya	623148	636487	2242900	27.78	28.38
18	Mizoram	651062	736171	2108100	30.88	34.92
19	Nagaland	766572	780119	1657900	46.24	47.05
20	Odisha	5973291	5967117	15570700	38.36	38.32
21	Punjab	161766	158655	5036200	3.21	3.15
22	Rajasthan	18151829	18034066	34223900	53.04	52.69
23	Sikkim	76300	76290	709600	10.75	10.75
24	Tamil Nadu	2442795	2440541	13005800	18.78	18.77
25	Telangana	3231346	3233421	11207700	28.83	28.85
26	Tripura	102741	102722	1048600	9.80	9.80
27	Uttar Pradesh	2860299	2857910	5348300	53.48	53.44
28	Uttarakhand	939699	945533	24092800	3.90	3.92
29	West Bengal	489470	493540	8875200	5.52	5.56
30	Andaman & Nicobar	53261	52928	824900	6.46	6.42
31	Chandigarh	57	57	11400	0.50	0.50
32	Dadra Nagar Haveli	5846	5830	49100	11.91	11.87
33	Daman and Diu	960	867	11200	8.57	7.74
34	Delhi	7298	7298	148300	4.92	4.92
35	Lakshadweep	47	42	3200	1.46	1.32
36	Puducherry	1804	1649	49200	3.67	3.35
	Total	91298198	91206650	328447200	27.80	27.77

LDA- Land Degradation Area, TGA- Total Geographical Area

Table 4: Category-wise distribution of land degradation (2005-06) in different States of India (area in ha)

Sl. No.	State	Water Erosion	Wind Erosion	Water Logging	Salinisation/ Alkalisiation	Acidification	Glacial	Anthropogenic	Others	Total
1	Andhra Pradesh	4786217	15556	8133	367343			50619	293183	5521051
2	Arunachal Pradesh	399427		35033		339881	585		165800	940726
3	Assam	349545		241191		73945		6516	25906	697103
4	Bihar	343207		668266	122016			4731	15454	1153674
5	Chhattisgarh	3242797				94		31454	356643	3630988
6	Goa	24857		769	1347	37		8120	7418	42548
7	Gujarat	1624152	1392	94290	3839898			25127	469712	6054571
8	Haryana	106063	144427	90630	92884			8402	10893	453299
9	Himachal Pradesh	315027		41			737847	1958	225087	1279960
10	Jammu & Kashmir	747760	236600	1187	45599		1887379	396	7353452	10272373
11	Jharkhand	1203097		354				24825	83418	1311694
12	Karnataka	4877327		2004	116516	33797		60136	180544	5270324
13	Kerala	75042		100080		54125		5442	94153	328842
14	Madhya Pradesh	5687743		92	25853			21109	211779	5946576
15	Maharashtra	10651730			183433	1351		30754	150554	11017822
16	Manipur	204234		1116		631684			22	837056
17	Meghalaya	73905		304		458765		6910	83264	623148
18	Mizoram	181183				469879				651062
19	Nagaland	22740				743423		409		766572
20	Odisha	5851720	335	14698	3066	18835		23231	61406	5973291
21	Punjab	63025	45185	13612	5253			11364	23327	161766
22	Rajasthan	2788368	13910949	8769	536065			57430	850248	18151829
23	Sikkim	5362					11271		59667	76300
24	Tamil Nadu	1768436	45382	10624	346480	124141		28484	119248	2442795
25	Telangana	2883627		2500	230692	249		41989	72289	3231346
26	Tripura	6052		295		95319		600	475	102741
27	Uttar Pradesh	1699581		446713	600678			20354	92973	2860299
28	Uttarakhand	621585		188			246776	1409	69741	939699
29	West Bengal	353896		109118	753			16608	9095	489470
30	Andaman & Nicobar	47751						161	5349	53261
31	Chandigarh	57								57
32	Dadra Nagar Haveli	5818		28						5846
33	Daman and Diu	422		364				133	41	960
34	Delhi	6098						21	1179	7298
35	Lakshadweep	5							42	47
36	Puducherry	86		3	1412				303	1804
	Grand Total	51017942	14399826	1850402	6519288	3045525	2883858	488692	11092665	91298198
	% TGA	15.53	4.38	0.56	1.98	0.93	0.88	0.15	3.38	27.80
	% LD	55.88	15.77	2.03	7.14	3.34	3.16	0.54	12.15	100.00

LDA- Land Degradation Area, TGA- Total Geographical Area

Table 5: Category-wise distribution of land degradation (2015-16) in different States of India (area in ha)

Sl. No	State	Water Erosion	Wind Erosion	Water Logging	Salinisation/ Alkalisiation	Acidification	Glacial	Anthropogenic	Others	Total
1	Andhra Pradesh	4773702	15556	4399	365639			59452	292008	5510756
2	Arunachal Pradesh	442920		35033		336881	585		167442	982861
3	Assam	359168		268671		73885		11703	27990	741417
4	Bihar	345027		711112	113918			4787	16834	1191678
5	Chhattisgarh	3236127				94		37451	356281	3629953
6	Goa	24732		769	1347	37		8823	7373	43081
7	Gujarat	1618709	1328	85339	3793377			35645	454500	5988898
8	Haryana	107110	131052	35260	95852			9078	10869	389221
9	Himachal Pradesh	315119		41			737847	1797	225037	1279841
10	Jammu & Kashmir	747713	236600	1187	45599		1887379	1139	7353221	10272838
11	Jharkhand	1196920		354				45979	76523	1319776
12	Karnataka	4876020		2004	116510	33797		62217	179657	5270205
13	Kerala	74695		69037		54092		5691	94021	297536
14	Madhya Pradesh	5630509		92	25601			42598	210642	5909442
15	Maharashtra	10613283			183433	1351		46212	148627	10992906
16	Manipur	221931		1343		631463			261	854998
17	Meghalaya	86767		304		458765		7387	83264	636487
18	Mizoram	266577				469594				736171
19	Nagaland	35843				743388		888		780119
20	Odisha	5832981	335	16091	3057	18835		34370	61448	5967117
21	Punjab	62568	44311	11447	4252			12614	23463	158655
22	Rajasthan	2752487	13805182	8769	536207			91655	839766	18034066
23	Sikkim	5362					11271		59657	76290
24	Tamil Nadu	1766278	45382	10540	346468	124141		28495	119237	2440541
25	Telangana	2879100		2499	230639	249		48855	72079	3233421
26	Tripura	6076		298		94906		1050	392	102722
27	Uttar Pradesh	1695505		444966	600630			24300	92509	2857910
28	Uttarakhand	621798		188			246776	2040	74731	945533
29	West Bengal	341584		111657	753			30219	9327	493540
30	Andaman & Nicobar	47388						191	5349	52928
31	Chandigarh	57								57
32	Dadra Nagar Haveli	5802		28						5830
33	Daman and Diu	329		364				133	41	867
34	Delhi	6098						21	1179	7298
35	Lakshadweep								42	42
36	Puducherry	16		3	1326				303	1649
	Grand Total	50996301	14279746	1821795	6464608	3041478	2883858	654791	11064073	91206650
	% TGA	15.53	4.35	0.55	1.97	0.93	0.88	0.20	3.37	27.77
	% LD	55.91	15.66	2.00	7.09	3.33	3.16	0.72	12.13	100.00

LDA- Land Degradation Area, TGA- Total Geographical Area

Table 6: Spatial distribution of dominant land degradation processes in India (ha)

SI No.	Process	Area (ha)		%TGA	
		2005-06	2015-16	2005-06	2015-16
1	Water erosion	51017942	50996301	15.53	15.53
2	Wind erosion	14399826	14279746	4.38	4.35
3	Water logging	1850402	1821795	0.56	0.55
4	Salinisation/ Alkalisation	6519287	6464608	1.98	1.97
5	Acidification	3045525	3041478	0.93	0.93
6	Glacial	2883858	2883858	0.88	0.88
7	Anthropogenic	488692	654791	0.15	0.20
8	Others	11092665	11064073	3.38	3.37
9	Total	91298198	91206650	27.80	27.77

Table 7: Process wise changes in land degradation status of India (Area in ha)

		2015-16										
	LD Process	Water Erosion	Wind Erosion	Water Logging	Salinisation/ Alkalisation	Acidification	Glacial	Anthropogenic	Others	Normal	LD Process Total (2005-06)	Total LD area during 2005-06
2005-06	Water Erosion	50721583		66	39			54710	340	241205	51017942	91298198
	Wind Erosion		14279651		6			799		119370	14399826	
	Water Logging			1736640	9551			873	523	102815	1850402	
	Salinisation/ Alkalisation			2117	6442877			4293		70000	6519287	
	Acidification	286				3041478		95	221	3445	3045525	
	Glacial						2883858			0	2883858	
	Anthropogenic	249						479983		8461	488692	
	Others	257		841	11397			24758	11048828	6583	11092665	
	Normal	273926	95	82131	738			89281	14160		460331	
	LD Process Total (2015-16)	50996301	14279746	1821795	6464608	3041478	2883858	654791	11064073			
	Total LD area during 2015-16	91206650										

Note: Blue colour indicates inter and intra-class changes; Green indicates LD areas became normal; Red colour indicates normal areas became degraded during 2005-6 and 2015-16.

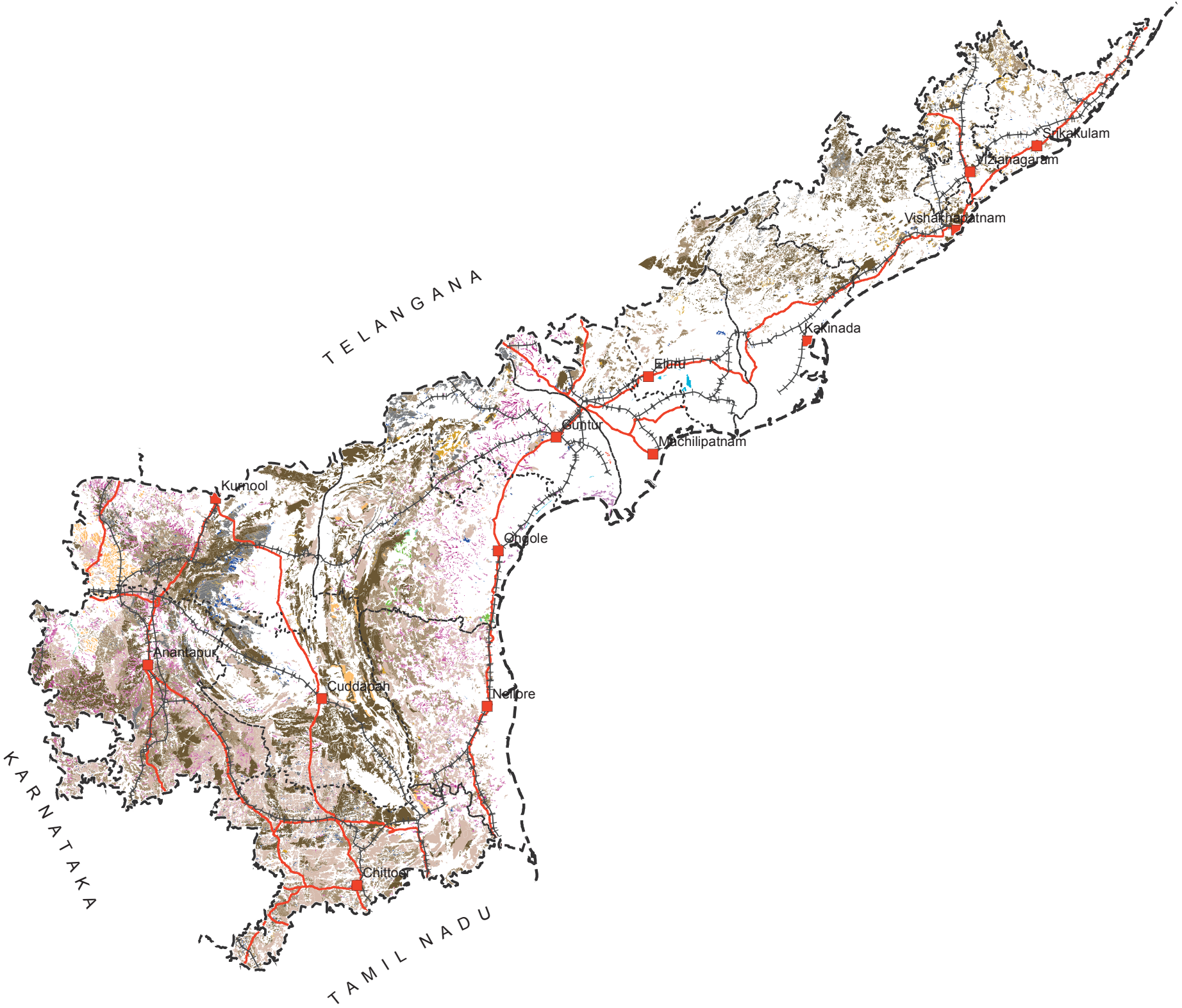
Table 8: Major positive and negative decadal changes in land degradation status of India

Sl. No.	Positive Changes	Area (ha)
1	Partially stabilized/Unstabilized dunes --> Stabilized Dunes	439210
2	Water erosion Severe --> Water erosion Moderate	418631
3	Water erosion Moderate/Severe/Rills --> Water erosion Slight	350644
4	Water erosion --> Normal	219165
5	Wind erosion --> Normal	119448
6	Water logging --> Normal	103643
7	Salinity --> Normal	69942
8	Barren Rocky --> Mining	24447
9	Saline Moderate --> Saline Slight	19525
10	Saline Severe --> Saline Moderate/ Slight	16914
11	Stabilized/Unstabilized dunes --> Wind Sheet erosion	15676
12	Industrial-effluent affected areas /Mining/Brick kiln --> Normal	8493
13	Mass Movement/Barren rocky/Riverine Sand --> Normal	8310
14	Surface Permanent/Sub-surface Water logging --> Seasonal Water logging	6328
15	Salinity --> Industrial-effluent affected areas /Mining/Brick kiln	4293
16	Saline-Sodic severe --> Saline-Sodic Moderate	4089
17	Acidification --> Normal	3448
18	Saline Sodic Moderate --> Saline-Sodic Slight	2767
19	Sodic Moderate --> Sodic Slight	2226
20	Salinity --> Water logging	2117
21	Unstabilized dunes --> Partially Stabilized Dunes	953
22	Water logging --> Riverine Sand	523
23	Sodic Severe --> Sodic Slight/Moderate	460

Sl. No.	Negative Changes	Area (ha)
1	Water erosion Moderate --> Water erosion Severe	314158
2	Normal --> Water erosion	273926
3	Water erosion Slight --> Water erosion Moderate/Severe	194833
4	Normal --> Water logging	82131
5	Water erosion --> Industrial-effluent affected areas /Mining/Brick kiln	54710
6	Normal --> Industrial-effluent affected areas /Mining/Brick kiln	63318
7	Normal --> Mass Movement /Riverine Sand	14160
8	Riverine Sand --> Salinity	11397
9	Saline Slight --> Saline Moderate/Severe	10481
10	Water logging --> Salinity	9551
11	Seasonal Water logging --> Surface Permanent/Sub-surface Water logging	5643
12	Saline Moderate --> Saline Severe	3945
13	Normal --> Salinity	738
14	Riverine Sand --> Water logging	841
15	Sodic Slight --> Sodic Moderate/Severe	824
16	Wind erosion --> Industrial-effluent affected areas /Mining/Brick kiln	799
17	Saline-Sodic Slight --> Saline Sodic Moderate/Severe	645
18	Water erosion --> Mass Movement/Riverine Sand	340
19	Acidity Moderate --> Acidification Severe	1351
20	Water logging --> Mining/Brick kiln	857

Note: Though transformations in salinity and water logging are mentioned as positive and negative changes, they are associative problems in majority of areas.

LAND DEGRADATION MAP OF ANDHRA PRADESH
2015-16

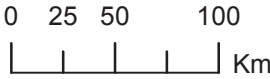
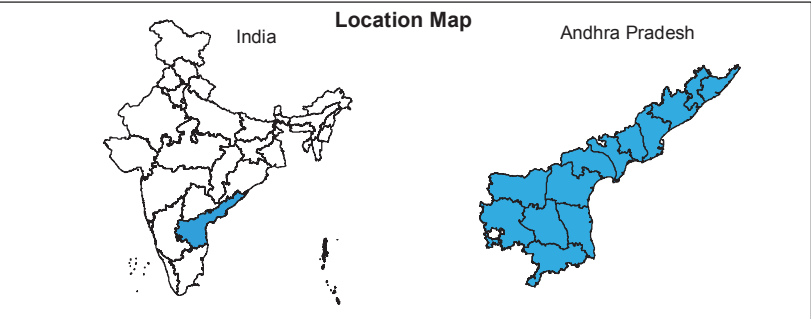
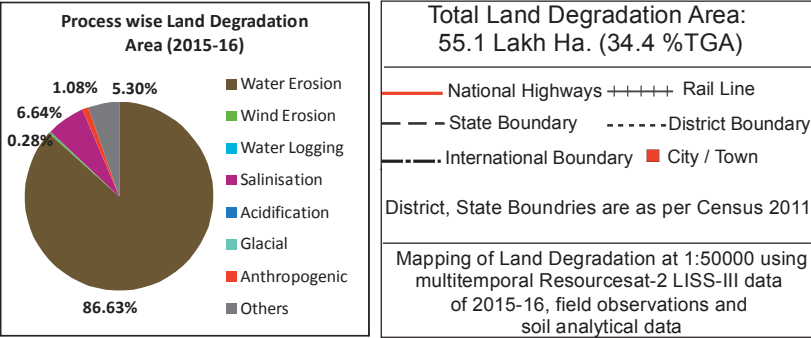


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S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		1401919
2		A2	Sheet erosion - Moderate		1444208
3		A3	Sheet erosion - Severe		1789560
4		A4	Rills		82902
5		A5	Gullies		55048
6		A6	Ravines-Shallow		65
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		3869
9		B2	Sheet erosion - Moderate		9842
10		B3	Sheet erosion - Severe		1695
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		150
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		4399
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		11964
17		D4-D6	Sodic - Slight/Moderate/Severe		270169
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		83506
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		1024
24		G2	Mining and dump areas		57572
25		G3	Brick kiln		856
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		281952
28		H3	RiverineSands/Sea Ingress etc		10056

Note: White colour in map indicates either no apparent degradation or normal land.



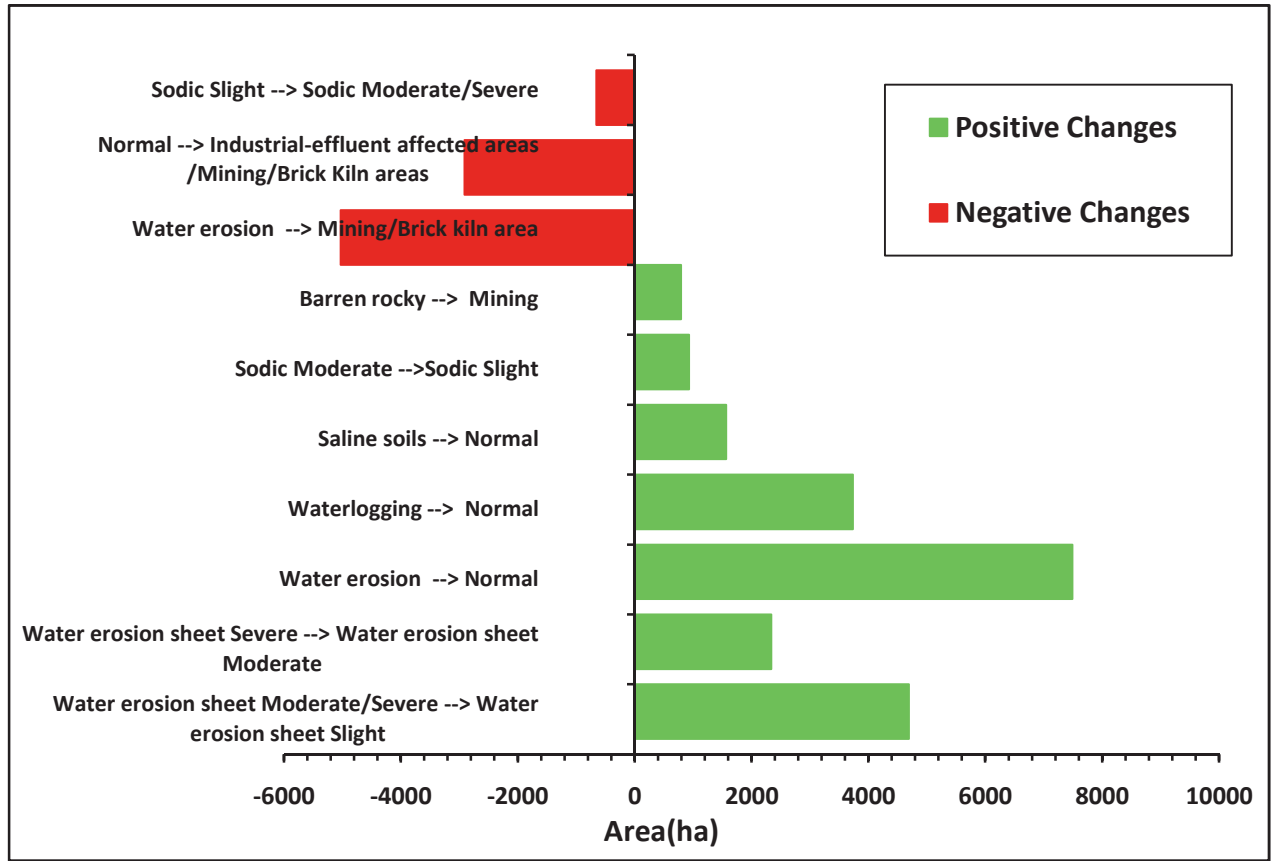
Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination National Remote Sensing Centre, Balanagar,Hyderabad-500037	Partner Institution(s) AP Space Applications Centre, Sri Ramachandra Nagar Vijayawada - 520008
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Table 9: Change matrix of land degradation classes in Andhra Pradesh State
(during 2005-06 and 2015-16)

Area in hectares

		2015-16																													
	LD Class	A1	A2	A3	A4	A5	A6	B1	B2	B3	B6	C1	D1	D2	D3	D4	D5	D6	D7	D8	D9	G1	G2	G3	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06		
2005-06	A1	1397223																					1922	14			3526	1402685	5521051		
	A2	3610	1441869																				1641	12			2140	1449272			
	A3	1086	2339	1789550																			1441	2			1749	1796167			
	A4				82902																							82902			
	A5					55048																					78	55126			
	A6						65																					65			
	B1							3869																				3869			
	B2								9842																			9842			
	B3									1695																		1695			
	B6										150																	150			
	C1											4399															3734	8133			
	D1												219															219			
	D2													6881													99	6980			
	D3														4864												17	4881			
	D4															173229	562	91					55				304	174241			
	D5															934	73945	122					51				618	75670			
	D6															140	107	21039					4				187	21477			
	D7																		33203			57		11	1		153	33425			
	D8																			37242		191		11	1		163	37608			
	D9																					12813					29	12842			
	G1																						906					906			
	G2																							49179			43	49222			
G3																								491			491				
H2																							797		281952	353	283102				
H3																									10056	25	10081				
N				10																		118	2460	335			2923				
	Class Total (2015-16)	1401919	1444208	1789560	82902	55048	65	3869	9842	1695	150	4399	219	6881	4864	174303	74614	21252	33203	37242	13061	1024	57572	856	281952	10056	13218				
	Total LD area in 2015-16	5510756																													

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 13218 ha (0.24 %)
*Normal land to Land degradation: (+) 2923 ha (0.05 %)
*Net decrease : (-) 10295 ha (0.19 %)
Percentage is w.r.t LD of Andhra Pradesh State during 2005-06

Green Denotes Land degradation to Normal land
Red Denotes change from Normal land to Land degradation
Black Denotes no change in Land degradation class
Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 10: Category - wise distribution of land degradation in different districts of Andhra Pradesh State

Area in hectares

LD Class	DISTRICTS															
	ANANTAPUR		CHITTOOR		CUDDAPAH		EAST GODAVARI		GUNTUR		KRISHNA		KURNOOL		NELLORE	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	300404	299785	411411	410095	162076	162000	40577	40553	32265	31922	13257	13231	110923	110708	168843	167836
A2	412138	411779	229772	228886	80599	80857	79567	79448	36475	36224	29480	29398	123945	123532	148963	148623
A3	278086	277568	150115	149683	355736	353270	134258	134174	40127	40115	21687	21404	303640	302880	61352	61132
A4	6003	6003	5079	5079	22232	22232			2338	2338			42001	42001	210	210
A5	9	9	2355	2338	1123	1123	2284	2284	13465	13465	1069	1069	4005	4005	2077	2077
A6																
B1	1826	1826														
B2	386	386													621	621
B3																
B6	11	11														
C1	3	3							95	95	134	32				
D1									132	132			10	10		
D2									5031	5010						
D3									3585	3579	150	150	29	29		
D4	107676	107597	9308	9518	5643	5399			1090	1090	837	837	24230	24059	22941	23198
D5	28464	28394	8999	8368	1352	1463			287	287	3	3	15182	15156	17652	17301
D6	4656	4554	1483	1497	613	599			15	15	136	136	3552	3538	9609	9500
D7	3101	3101	118	118	200	143			15067	15016	8329	8236	1406	1406	49	49
D8	2012	2012	82	82	151	128			11971	11818	1308	1255	7366	7279	830	830
D9	1309	1309	46	46	64	144			2930	3011	224	277	2505	2505	1450	1450
G1	182	283			135	152					377	377	27	27		
G2	3792	4178	11032	12261	3507	5184	612	968	3809	4344	1104	1770	18055	18781	659	1295
G3		1	38	52		1			387	472				6		
H2	59173	59105	26029	25830	28660	28375	6658	6658	57203	57084	6435	6257	71761	71532	821	810
H3	183	183	14	14	481	481	3271	3246	376	376	475	475	38	38	463	463
Total	1209414	1208087	855881	853867	662572	661551	267227	267331	226648	226393	85005	84907	728675	727492	436540	435395

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Andhra Pradesh State

Area in hectares

LD Class	DISTRICTS											
	PRAKASAM		SRIKAKULAM		VISHAKHAPATNAM		VIZIANAGARAM		WEST GODAVARI		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	124210	127243	17767	17721	7504	7494	2646	2602	10802	10729	1402685	1401919
A2	167038	164694	38495	38122	39570	39570	40175	40081	23055	22994	1449272	1444208
A3	179800	178413	4498	4411	174146	173939	44697	44682	48025	47889	1796167	1789560
A4	4262	4262			91	91	686	686			82902	82902
A5	2743	2743	5570	5570	8347	8347	10652	10591	1427	1427	55126	55048
A6							65	65			65	65
B1	2043	2043									3869	3869
B2	8835	8835									9842	9842
B3	1695	1695									1695	1695
B6	139	139									150	150
C1	651	651							7250	3618	8133	4399
D1	77	77									219	219
D2	1949	1871									6980	6881
D3	1117	1106									4881	4864
D4	2516	2605									174241	174303
D5	3731	3642									75670	74614
D6	1413	1413									21477	21252
D7	5155	5134									33425	33203
D8	13888	13838									37608	37242
D9	4314	4319									12842	13061
G1					185	185					906	1024
G2	2575	3389	825	1506	1157	1243	1094	1377	1001	1276	49222	57572
G3		179	57	81	9	61		3			491	856
H2	9368	9368	525	503	12973	12944	3496	3486			283102	281952
H3	832	832	2301	2301	1499	1499	10	10	138	138	10081	10056
Total	538351	538491	70038	70215	245481	245373	103521	103583	91698	88071	5521051	5510756

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Anantapur District (1208087 ha, 64% of district TGA)

Maximum changes in land degradation:-West Godavari District (-3627 ha, 0.07 % of Total LD area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

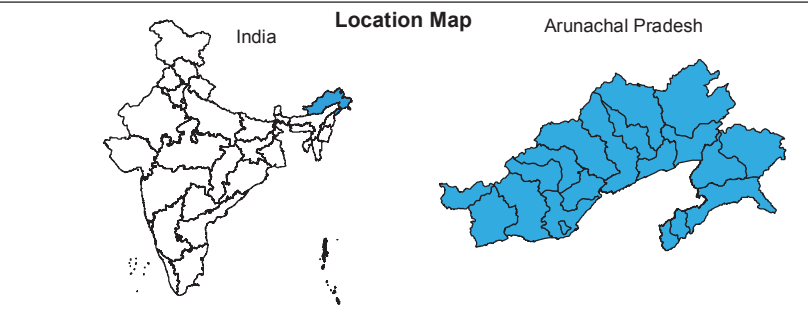
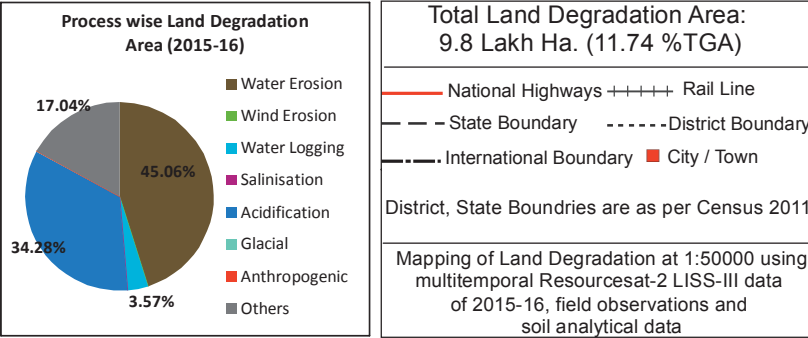
LAND DEGRADATION MAP OF ARUNACHAL PRADESH
2015-16

ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

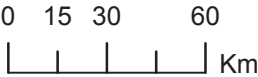
S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		404970
2		A2	Sheet erosion - Moderate		6107
3		A3	Sheet erosion - Severe		31836
4		A4	Rills		
5		A5	Gullies		7
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		16382
15		C3	Subsurface waterlogged		18651
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		336881
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		585
23	Anthropogenic	G1	Industrial effluent affected areas		
24		G2	Mining and dump areas		
25		G3	Brick kiln		
26	Others	H1	Mass movement / mass wastage		4775
27		H2	Barren rocky / Stony waste		162631
28		H3	RiverineSands/Sea Ingress etc		36

Note: White colour in map indicates either no apparent degradation or normal land.



Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination North Eastern Space Application Centre (NESAC),Umiam-793103 (Meghalaya)	Partner Institution(s) SRSAC, A.P. State Council for Science & Technology, Itanagar - 791113
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Fig. 4

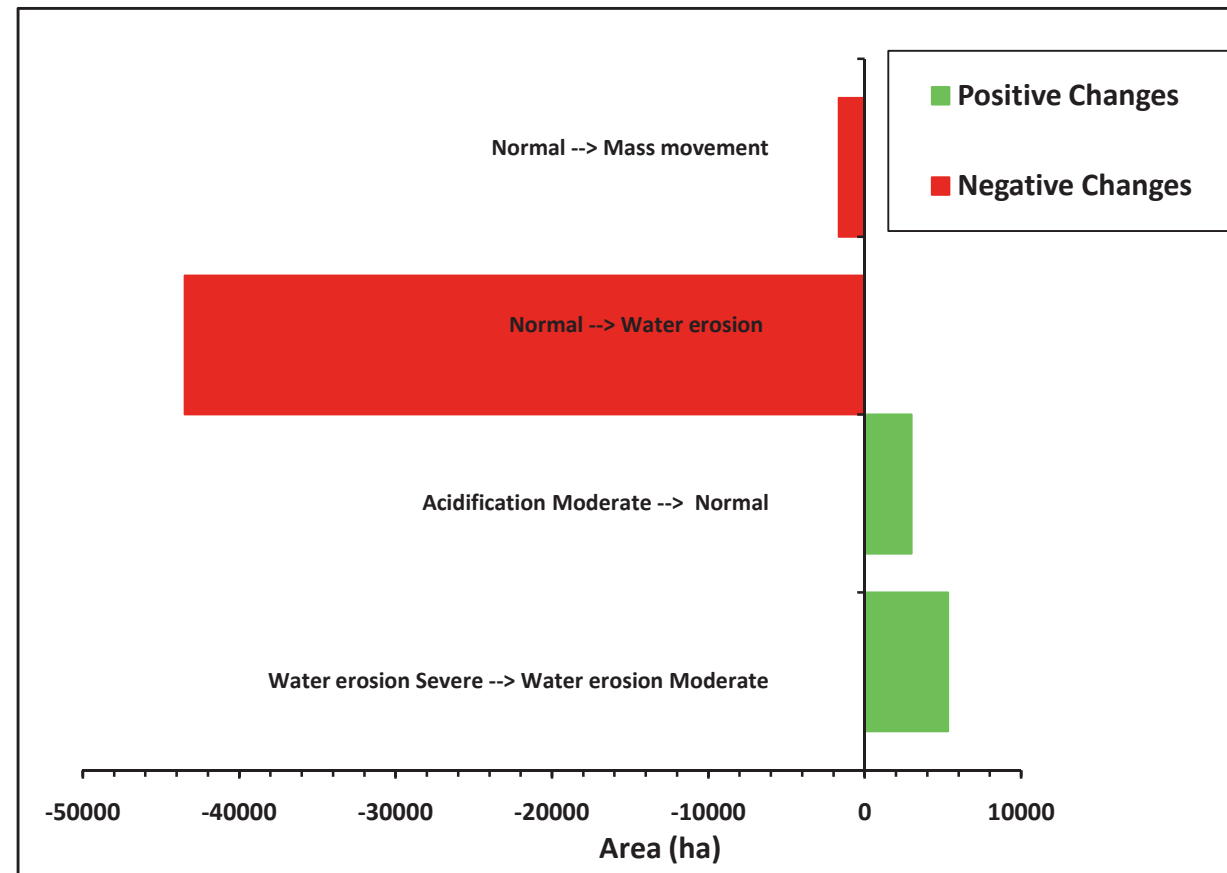


**Table 11: Change matrix of land degradation classes in Arunachal Pradesh State
(during 2005-06 and 2015-16)**

Area in hectares

		2015-16															
	LD Class	A1	A2	A3	A5	C1	C2	C3	E1	E2	F2	H1	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06
2005-06	A1	361377														361377	940726
	A2	178	691													869	
	A3		5338	31836												37174	
	A5				7											7	
	C1					12390										12390	
	C2					151	3841									3992	
	C3							18651								18651	
	E1								334734	491					3000	338225	
	E2									1656						1656	
	F2										585					585	
	H1											3101			32	3133	
	H2												162631			162631	
	H3													36		36	
	N	43415	78									1674				45167	
	Class Total (2015-16)	404970	6107	31836	7	12541	3841	18651	334734	2147	585	4775	162631	36	3032		
	Total LD area in 2015-16	982861															

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 3032 ha (0.32 %)

*Normal land to Land degradation: (+) 45167 ha (4.8 %)

*Net increase: (+) 42135 ha (4.48 %)

Percentage is w.r.t LD of Arunachal Pradesh State during 2005-06

Green Denotes Land degradation to Normal land

Red Denotes change from Normal land to Land degradation

Black Denotes no change in Land degradation class

Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 12: Category - wise distribution of land degradation in different districts of Arunachal Pradesh State

Area in hectares

	DISTRICTS																			
LD Class	ANJAW		CHANGLANG		DIBANG VALLEY		EAST KAMENG		EAST SIANG		ITANAGAR		KHONSA		KRA DAADI		KURUNG KUMEY		LOHIT	
	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16
A1	138362	138835	2145	4845	295	572	12001	14994	13	1210	4	427		4668	22827	23940	34322	35126	1285	9114
A2				501		40	406	314		1598			15	32						2497
A3	3	3	551	50	2999	2959	3	3	2960	1362			488	463					7512	5015
A5															7	7				
C1			1027	1027					2140	2140									4848	4854
C2									2772	2772									982	976
C3			4210	4210					6270	6270									5827	5827
E1	11801	11801	36937	36653	8042	8042	14452	14329	24413	24413	1653	1653	18005	18005	8988	8988	7564	7564	49144	49144
E2	14	14		103			41	71	143	143			4	4						
F2																				
H1	237	264	119	129	70	113	214	347	324	353	4	28			7	73	4	39	290	395
H2	67256	67256			213	213	12464	12464							13155	13155	1166	1166	65	65
H3	10	10							9	9										
Total	217683	218183	44989	47518	11619	11939	39581	42522	39044	40270	1661	2108	18512	23172	44984	46163	43056	43895	69953	77887

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Arunachal Pradesh State

Area in hectares

LD Class	DISTRICTS																					
	LOWER DIBANG VALLEY		LOWER SUBANSIRI		PAPUMPARE		SIANG		TAWANG		TIRAP		UPPER SIANG		UPPER SUBANSIRI		WEST KAMENG		WEST SIANG		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	9	2267		1873	203	4039	62	2475	40813	40813	102	1782	30	1823	65699	67866	34400	34853	8805	13448	361377	404970
A2		76		11	305	309		13				409		159			120	125	23	23	869	6107
A3	192	116	396	385	212	208	75	62	17454	17454	724	315	993	834	452	452	943	938	1217	1217	37174	31836
A5																					7	7
C1	4375	4520																			12390	12541
C2	238	93																			3992	3841
C3	2342	2342															2	2			18651	18651
E1	11381	11381	20041	20029	14040	13835	7609	7609	12397	12397	11267	11163	6444	6444	10918	10918	32335	29609	30794	30757	338225	334734
E2			1236	1248	76	281						104							142	179	1656	2147
F2									516	516							69	69			585	585
H1	408	637	89	173	476	687	7	52	27	60			145	285	21	60	588	809	103	271	3133	4775
H2	60	60			250	250			32069	32069					30044	30044	5512	5512	377	377	162631	162631
H3							11	11					6	6							36	36
Total	19005	21492	21762	23719	15562	19609	7764	10222	103276	103309	12093	13773	7618	9551	107134	109340	73969	71917	41461	46272	940726	982861

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Anjaw District (218183 ha, 35.2% of TGA)

Maximum changes in land degradation:-Lohit District (+7934 ha, 0.01 % of Total LD area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

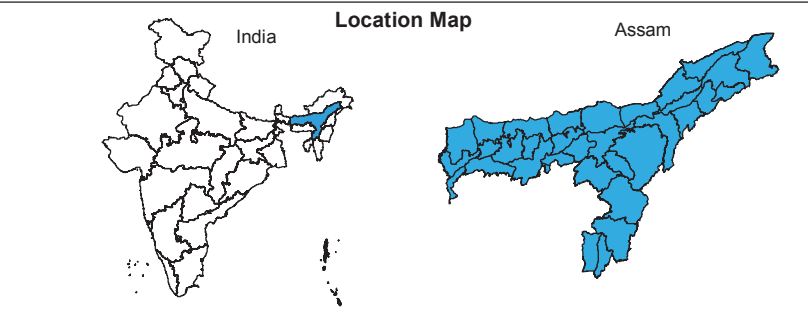
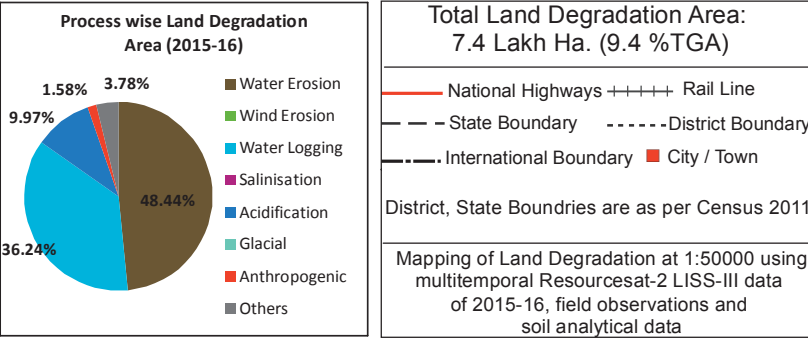
LAND DEGRADATION MAP OF ASSAM
2015-16

ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		77972
2		A2	Sheet erosion - Moderate		233749
3		A3	Sheet erosion - Severe		46409
4		A4	Rills		878
5		A5	Gullies		160
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		219896
15		C3	Subsurface waterlogged		48775
16	Salinisation / Alkalisatation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		73885
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		764
24		G2	Mining and dump areas		1068
25		G3	Brick kiln		9871
26	Others	H1	Mass movement / mass wastage		278
27		H2	Barren rocky / Stony waste		34
28		H3	RiverineSands/Sea Ingress etc		27678

Note: White colour in map indicates either no apparent degradation or normal land.



Project Execution	Regional Coordination	Partner Institution(s)
Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	North Eastern Space Application Centre (NESAC),Umiam-793103 (Meghalaya)	Assam RS Application Centre, A.S.T.E Council, Bigyan Bhawan, Near IDBI Building,G.S.Road, GUWAHATI – 781 005

Fig. 5

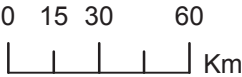
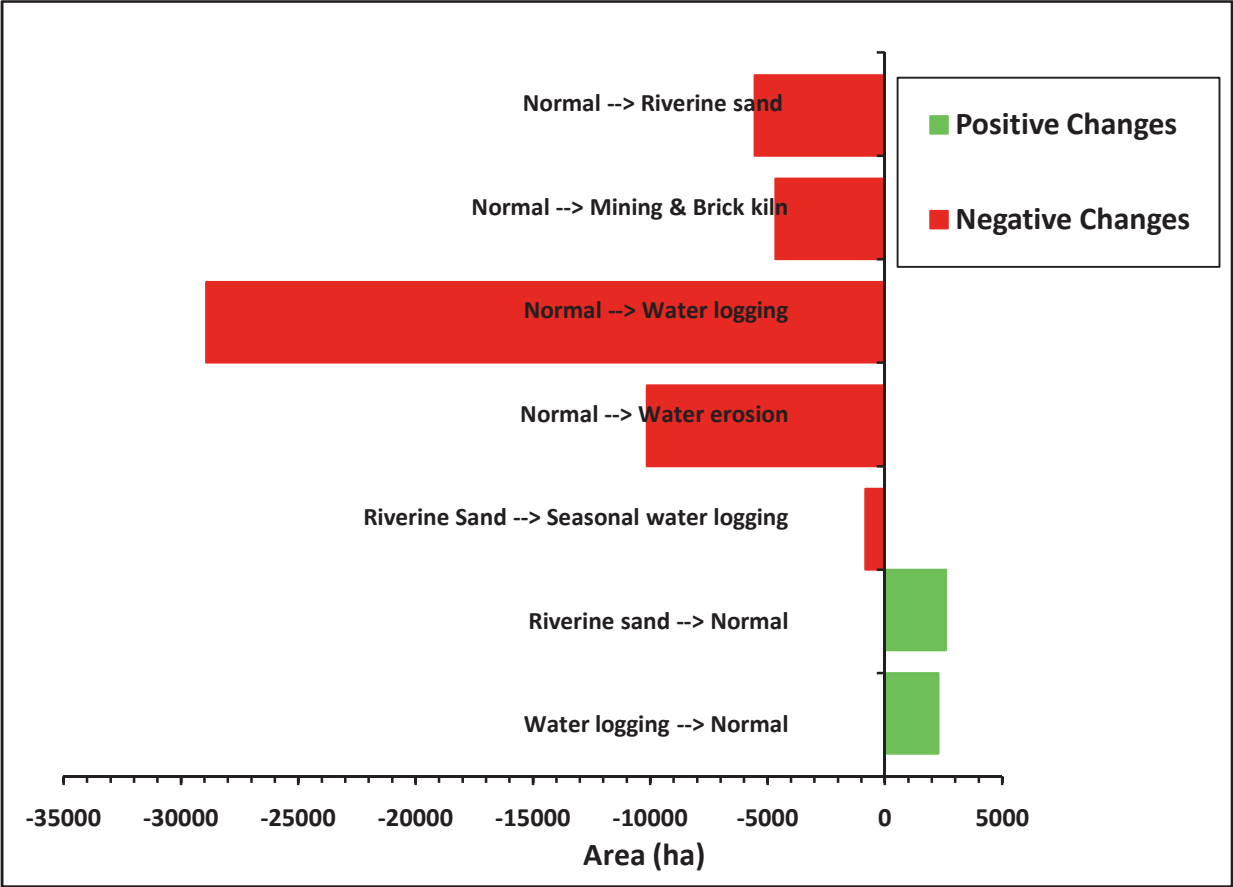


Table 13: Change matrix of land degradation classes in Assam State
(during 2005-06 and 2015-16)

		2015-16																	Area in hectares	
	LD Class	A1	A2	A3	A4	A5	C1	C2	C3	E1	E2	G1	G2	G3	H1	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06
2005-06	A1	76539												525					77064	697103
	A2		229785																229785	
	A3			41658															41658	
	A4				878														878	
	A5					160													160	
	C1						174110											2123	176233	
	C2							22982										160	23142	
	C3								41816										41816	
	E1									72696								39	72735	
	E2										1189			21					1210	
	G1											764							764	
	G2												863						863	
	G3													4866				23	4889	
	H1														267			36	303	
	H2															34			34	
	H3																22116	2615	25569	
	N	1433	3964	4751			19820	2146	6959				205	4459	11		5562		49310	
	Class Total (2015-16)	77972	233749	46409	878	160	194768	25128	48775	72696	1189	764	1068	9871	278	34	27678	4996		
	Total LD area in 2015-16	741417																		

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 4996 ha (0.72 %)
 Green Denotes Land degradation to Normal land

*Normal land to Land degradation: (+) 49310 ha (7.07 %)
 Red Denotes change from Normal land to Land degradation

*Net increase: (+) 44314 ha (6.36 %)
 Black Denotes no change in Land degradation class

Percentage is w.r.t LD of Assam State during 2005-06
 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 14: Category - wise distribution of land degradation in different districts of Assam State

Area in hectares

LD Class	DISTRICTS																							
	BAKSA		BARPETA		BISWANATH		CACHAR		CHARADEO		CHIRANG		DARRANG		DHEMAJI		DHUBURI		DIBRUGARH		DIMA HASAO		GOALPARA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	2278	2288	90		256	256	410	410	1428	1428	4617	4617	149	56	25	25	613	531	2266	2266	74	74	146	199
A2	1604	1605			21889	22111	2602	2602	50	50	13339	13339	58	58	368	368			312	312	37569	37848	1277	1277
A3							1356	1356			65	65			96	96					18143	19384	130	130
A4																								
A5																	65	65						
C1	8147	8330	27779	27855	7	63	143	143	185	517	4045	4041	10643	10715	2158	6738	8089	8145	89	1065	3	3	11992	14189
C2	833	817	4281	4281			230	230			32	32	1222	1152	123	123	270	270					59	59
C3	1363	1363	330	330	1082	1164	75	75	27	27	1534	1534	2682	2682	1950	3074	577	577	3340	3340			583	583
E1	145	132	1949	1935	18	17	1033	1033	13	13			89	89	3563	3555			9	9	46900	46900	860	860
E2							3	3															18	18
G1																					199	199		
G2																	18	18			202	202	6	6
G3	39	63	163	280	366	461	70	519	70	104			209	362			286	611	471	608			6	61
H1																					14	14		
H2																					23	23		
H3	4830	4800	2573	2802		51	65	65			1928	2056	1454	1750	2426	2705	758	1015			708	705	381	381
Total	19239	19398	37165	37483	23618	24123	5987	6436	1773	2139	25560	25684	16506	16864	10709	16684	10676	11232	6487	7600	103835	105352	15458	17763

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Assam State

Area in hectares

	DISTRICTS																					
LD Class	GOLAGHAT		HAILAKANDI		HOJAI		JORHAT		KAMRUP		KAMRUP METROPOLITAN		KARBI ANGLONG		KARBI ANGLONG WEST		KARIMGANJ		KOKRAJHAR		LAKHIMPUR	
	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16
A1	18561	18680	511	511	1306	1306	149	349	3960	4547	2661	2548	6234	6234	62	62	1945	1951	13643	13643	3054	3054
A2	2259	2263	3458	3492	3538	3538	634	1355	16237	16237	1816	1828	29560	30414	38756	38968	4106	4140	10233	10288	686	686
A3			1972	1972	1616	1616	11	11	393	393			10068	10068	1001	1001					333	333
A4									5	5	123	123							611	611	99	99
A5									42	42									53	53		
C1	6818	6720	9	36	1290	1280	45	42	25882	26668	5219	5359			1	1	603	858	5367	5438	9687	9934
C2	118	103	24	24	74	68			6574	6562	3631	3631					66	66	490	490		
C3	4676	4676			1177	3993	934	1206	2004	2004	317	317	5	1402		200			2791	2791	1193	1427
E1			1274	1274					3299	3299	1759	1759	884	884	112	112	1608	1608	96	96	4664	4664
E2	98	98					1021	1000					13	13								
G1	415	415					105	105														
G2					49	88			79	79	11	11										
G3	194	503	20	118	29	29	454	622	372	516	560	701	98	184			230	471		20		
H1									10	10												
H2																						
H3	332	329			29	29			2267	2688	91	97						6	1192	1129	253	267
Total	33471	33787	7268	7427	9108	11947	3353	4690	61124	63050	16188	16374	46862	49199	39932	40344	8558	9100	34476	34559	19969	20464

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Assam State

Area in hectares

	DISTRICTS																					
LD Class	MAJULI		MARIGAON		NAGAON		NALBARI		SIVASAGAR		SONGAIGAON		SONITPUR		SOUTH SALMARA MANKAGHAR		TINSUKIA		UDALGURI		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	51	51	523	488	1147	1147	41		4035	4226	140	143	3026	3064		7	3303	3408	360	403	77064	77972
A2			1787	1849	974	974			512	1512			31397	31852			2580	2580	2184	2203	229785	233749
A3											51	51	5152	6233			117	117	1154	3583	41658	46409
A4													40	40							878	878
A5																					160	160
C1	252	252	12813	18678	9199	10710	15203	15337	3015	3669	3251	3293	16	169	542	708	1474	1566	2267	2246	176233	194768
C2			3645	3965	13	13	1149	1161			25	25		648			103	103	180	1305	23142	25128
C3	2525	2867	389	389	3243	3715	413	413	733	753	441	441	1547	1547	22	22	823	823	5040	5040	41816	48775
E1			583	583	2314	2314	51	51	7	7			5	5	83	83	1370	1367	47	47	72735	72696
E2			8	8					49	49											1210	1189
G1			45	45																	764	764
G2																	498	660		4	863	1068
G3		42	300	529	317	998	138	193	99	261	11	577	29	594			329	384	29	60	4889	9871
H1			279	254																	303	278
H2			11	11																	34	34
H3		65	2792	2606	1020	571	566	657		31	838	940		20	112	160	220	177	734	1576	25569	27678
Total	2828	3277	23175	29405	18227	20442	17561	17812	8450	10508	4757	5470	41212	44172	759	980	10817	11185	11995	16467	697103	741417

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Dima Hasao District (105352 ha, 21.5 % of district TGA)

Maximum changes in land degradation:-Marigaon District (+6230 ha, 0.9% of Total LD area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

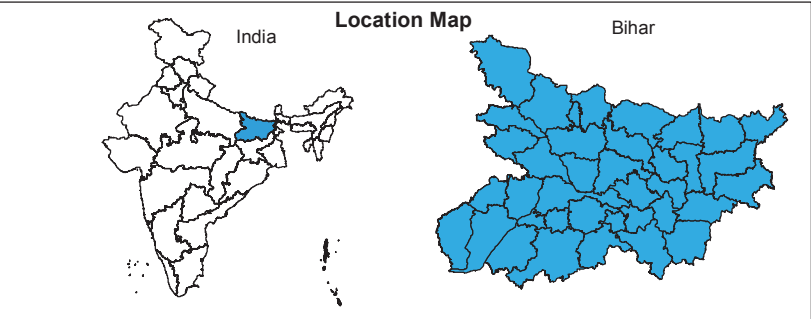
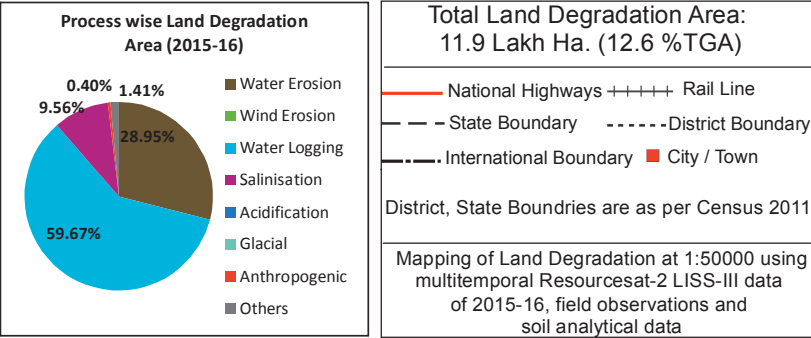
LAND DEGRADATION MAP OF BIHAR
2015-16

ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		19601
2		A2	Sheet erosion - Moderate		238047
3		A3	Sheet erosion - Severe		79571
4		A4	Rills		7808
5		A5	Gullies		
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		708082
15		C3	Subsurface waterlogged		3030
16	Salinisation / Alkalisatation	D1-D3	Saline - Slight/Moderate/Severe		89028
17		D4-D6	Sodic - Slight/Moderate/Severe		23820
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		1070
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		1518
24		G2	Mining and dump areas		1742
25		G3	Brick kiln		1527
26	Others	H1	Mass movement / mass wastage		14453
27		H2	Barren rocky / Stony waste		
28		H3	RiverineSands/Sea Ingress etc		2381

Note: White colour in map indicates either no apparent degradation or normal land.



Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination Regional Remote Sensing Centre- East, Jyoti Basu Nagar, Kolkata-700156	Partner Institution(s) Bihar RS Appl. Centre, Adalatganj, Bailey Road, Patna – 800001
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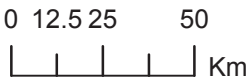
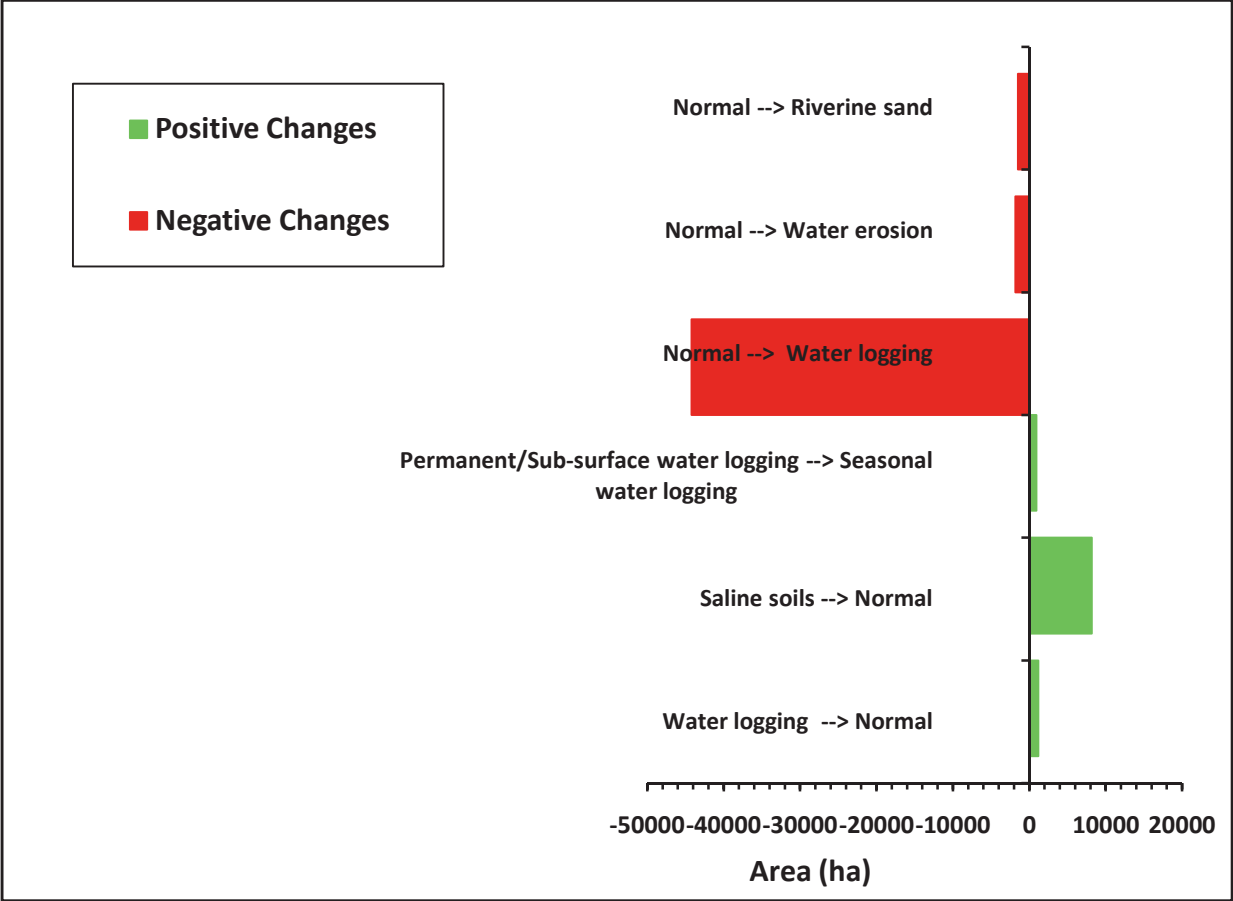


Table 15: Change matrix of land degradation classes in Bihar State
(during 2005-06 and 2015-16)

Area in hectares																					
		2015-16																			
	LD Class	A1	A2	A3	A5	C1	C2	C3	D1	D2	D3	D4	D5	D7	G1	G2	G3	H2	H3	N	Class Total (2005-06)
2005-06	A1	18702	4																		18706
	A2	40	237065																		237105
	A3		17	79571																	79588
	A5				7808																7808
	C1					657013	102	245	78										120		657558
	C2					445	5793													909	7147
	C3					495	5	2785												276	3561
	D1								77325											5121	82446
	D2								79	11546										40	11665
	D3										168										168
	D4											22365								3015	25380
	D5											68	1219								1287
	D7													1070							1070
	G1														1518						1518
	G2															1686					1686
	G3																1527				1527
	H2																	14453			14509
	H3																		789	156	945
	N	859	961			39876	4353												1472		47521
	Class Total (2015-16)	19601	238047	79571	7808	697829	10253	3030	77482	11546	168	22433	1219	1070	1518	1742	1527	14453	2381	9517	
	Total LD area in 2015-16	1191678																			

Significant land degradation changes between 2005-06 and 2015-16



•Land degradation to Normal land : (-) 9517 ha (0.82 %)
 Green Denotes Land degradation to Normal land

•Normal land to Land degradation: (+) 47521 ha (4.12 %)
 Red Denotes change from Normal land to Land degradation

•Net increase: (+) 38004 ha (3.29 %)
 Black Denotes no change in Land degradation class

Percentage is w.r.t LD of Bihar State during 2005-06
 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 16: Category - wise distribution of land degradation in different districts of Bihar State

Area in hectares

	DISTRICTS																									
LD Class	ARARIA		ARWAL		AURANGABAD		BANKA		BEGUSARAI		BHABHUA		BHAGALPUR		BHOJPUR		BUXAR		CHHAPRA		DARBHANGA		GAYA		GOPALGANJ	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1					948	948	1003	999			1456	1456	637	637									4762	4762		
A2					3568	3568	37301	37305			32738	33210											9250	9250		
A3					2317	2317	10307	10307			49426	49409							3	3			10792	10792		
A5					8	8	1283	1283			1282	1282											754	754		
C1	25688	25787	2232	2338	1635	2695	403	408	33460	33928	2170	2170	45880	46377	11465	11855	12304	12413	20829	26721	41211	41363	1335	3604	6932	7650
C2	4	32			88	31			3	3					2287	2172			254	254	615	476			360	558
C3					7	7							9	9							5				1790	1628
D1	2	2					140		2053	1301	7905	7455	1061	994	3272	1853	4060	3978	10563	10412			442	442	5611	5697
D2																									6380	6261
D3																									4	4
D4							20	20			2929	2487	449	449	3163	2998			3943	4011						
D5																			1273	1205					14	14
D7																			191	191					13	13
G1									200	200			528	528												
G2					42	42							44	44									125	125		
G3											278	278			71	71			23	23			3	3	4	4
H2					927	927	2210	2210			1293	1293	307	307									3346	3346		
H3			9	14			120	120							12	12	32	32			44	44			37	37
Total	25694	25821	2241	2352	9540	10543	52787	52652	35716	35432	99477	99040	48915	49345	20270	18961	16396	16423	37079	42820	41875	41883	30809	33078	21145	21866

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Bihar State

Area in hectares

	DISTRICTS																							
LD Class	JAMUI		JHANABAD		KATIHAR		KHAGARIA		KISHANGANJ		LAKHISARAI		MADHEPURA		MADHUBANI		MUNGER		MUZAFFARPUR		NALANDA		NAWADA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	3531	3531	452	452							172	172					496	496			134	134	664	701
A2	60036	60542	47	47							6001	6001					9059	9059			3934	3934	22057	22020
A3	2086	2086															91	91					1389	1389
A5	3374	3374															55	55					708	708
C1	7	817	656	1743	33700	33826	53552	53721	619	1277	19978	20218	31526	31827	20552	21252	15062	15062	28346	29643	7616	11720	349	2048
C2					14	7	71	71					259	159					223	211				
C3					18	18			145	141														
D1			50	50	225	219	216	216					1028	695	1015	442			9869	9869				
D2																			4802	4802				
D3																			64	64				
D4			135	135															363	363				
D5																								
D7																								
G1																					203	203		
G2																							123	123
G3																			53	53				
H2	1001	1001	249	249							618	618					768	768			52	52	2122	2122
H3	57	57											28	28	216	60								
Total	70092	71408	1589	2676	33957	34070	53839	54008	764	1418	26769	27009	32841	32709	21783	21754	25531	25531	43720	45005	11939	16043	27412	29111

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Bihar State

Area in hectares

	DISTRICTS																											
LD Class	PASHCHIM CHAMPARAN		PATNA		PURBA CHAMPARAN		PURNIA		ROHTAS		SAHARSA		SAMASTIPUR		SHEIKHPURA		SHEOHAR		SITAMARHI		SIWAN		SUPAUL		VAISHALI		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	4	4							4276	5135					171	174											18706	19601
A2	13435	13435							39676	39676					3												237105	238047
A3									3177	3177																	79588	79571
A5									344	344																	7808	7808
C1	13887	14449	42993	47364	18851	19337	46042	47128	14	331	21948	22460	54010	54772	7344	8238	1594	1725	9255	10067	6740	7363	13373	15324	4000	8808	657558	697829
C2	351	419	95	6	386	617	296	602			586	393	230	223					87	35	88	3147	819	819	31	18	7147	10253
C3					505	636	29	29					7	7							404	404	642	151			3561	3030
D1	2940	2940			5216	5164	956	573	419	419	1642	1056	1925	1868			138	138	2925	2925	11979	12015	37	2	6757	6757	82446	77482
D2													464	464							9	9			10	10	11665	11546
D3													58	58											42	42	168	168
D4			6322	4025					2582	2471			2110	2110											3364	3364	25380	22433
D5																											1287	1219
D7													198	198							397	397			271	271	1070	1070
G1			587	587																							1518	1518
G2									1132	1188					220	220											1686	1742
G3	4	4	748	748	73	73			111	111									23	23			136	136			1527	1527
H2									1274	1218					342	342											14509	14453
H3					26	26											185	185			119	217	60	1549			945	2381
Total	30621	31251	50745	52730	25057	25853	47323	48332	53005	54070	24176	23909	59002	59700	8080	8974	1917	2048	12290	13050	19736	23552	15067	17981	14475	19270	1153674	1191678

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Bhabua District (99040 ha, 30% of district TGA)

Maximum changes in land degradation:-Chhapra District (+5741 ha, 0.5% of Total LD area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF CHHATTISGARH
2015-16

UTTAR PRADESH

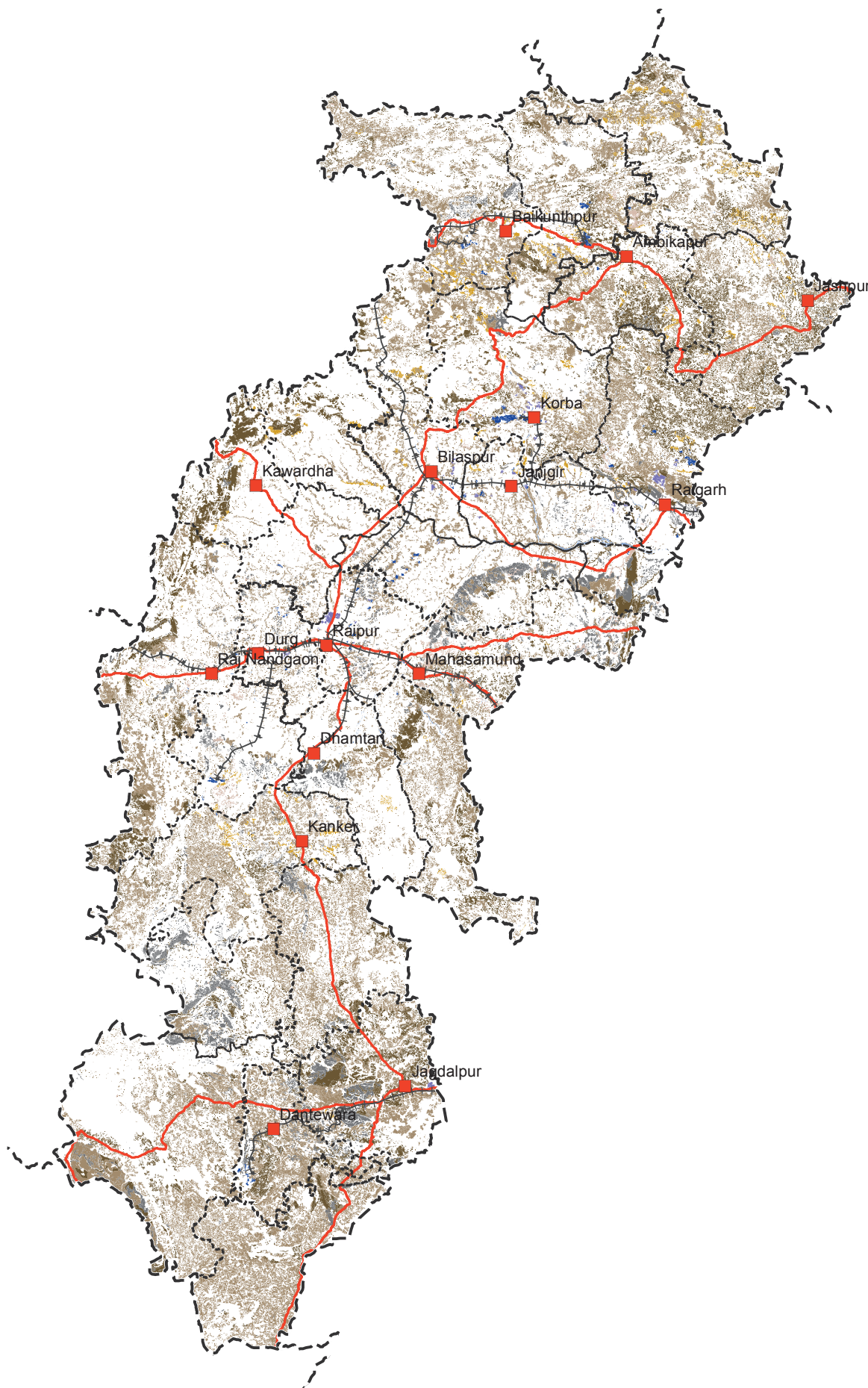
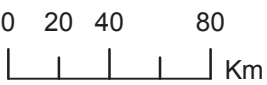


Fig. 7



ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		45825
2		A2	Sheet erosion - Moderate		2142863
3		A3	Sheet erosion - Severe		950828
4		A4	Rills		
5		A5	Gullies		96611
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic - Moderate/Severe		94
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		15548
24		G2	Mining and dump areas		21675
25		G3	Brick kiln		228
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		342964
28		H3	RiverineSands/Sea Ingress etc		13317

Note: White colour in map indicates either no apparent degradation or normal land.

Process wise Land Degradation Area (2015-16)

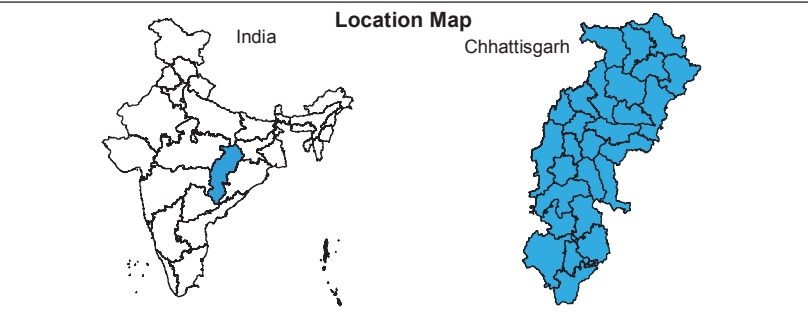
- Water Erosion
- Wind Erosion
- Water Logging
- Salinisation
- Acidification
- Glacial
- Anthropogenic
- Others

Total Land Degradation Area: 36.3 Lakh Ha. (26.8 %TGA)

— National Highways +++++ Rail Line
--- State Boundary - - - - - District Boundary
- - - - - International Boundary ■ City / Town

District, State Boundries are as per Census 2011

Mapping of Land Degradation at 1:50000 using multitemporal Resourcesat-2 LISS-III data of 2015-16, field observations and soil analytical data

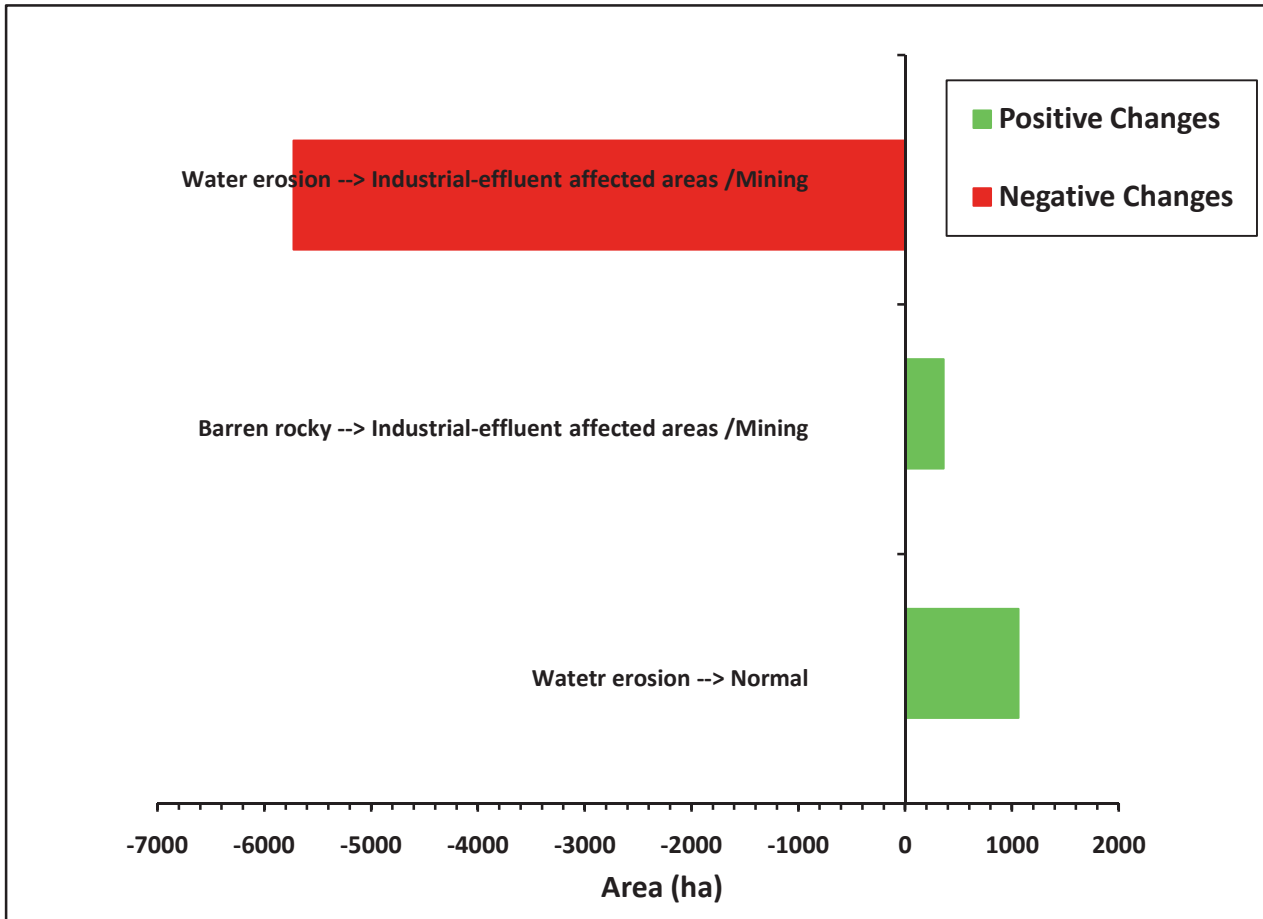


**Table 17: Change matrix of land degradation classes in Chhattisgarh State
(during 2005-06 and 2015-16)**

Area in hectares

		2015-16												
	LD Class	A1	A2	A3	A5	E1	G1	G2	G3	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06
2005-06	A1	45747						27					45774	3630988
	A2		2142820				1833	3089				799	2148541	
	A3			950828			12	487				253	951580	
	A5				96611		280					11	96902	
	E1					94							94	
	G1						13218						13218	
	G2							17915				120	18035	
	G3								201				201	
	H2						205	157		342964			343326	
	H3										13317		13317	
	N	78	43						27				148	
	Class Total (2015-16)	45825	2142863	950828	96611	94	15548	21675	228	342964	13317	1183		
	Total LD area in 2015-16	3629953												

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 1183 ha (0.03%)
 *Normal land to Land degradation: (+) 148 ha (0.004%)
 *Net decrease: (-) 1035 ha (0.029%)
 # Percentage is w.r.t LD of Chhattisgarh State during 2005-06

Green Denotes Land degradation to Normal land
Red Denotes change from Normal land to Land degradation
Black Denotes no change in Land degradation class
Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 18: Category - wise distribution of land degradation in different districts of Chhattisgarh State

Area in hectares

LD Class	DISTRICTS																							
	BALOD		BALODABAZAR		BALRAMPUR		BASTAR		BEMETRA		BIJAPUR		BILASPUR		DANTEWARA		DHAMTARI		DURG		GARIABANDI		JANJGIR CHAMPA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	5363	5363	1942	1942	4575	4575	1354	1354	199	199	267	267	803	803	60	60			371	371	305	305	785	785
A2	16595	16581	63765	62945	111858	111675	120625	120531	28071	28058	184447	184447	82413	82218	89559	89559	28082	28082	24106	24081	84275	84265	46553	45506
A3	3262	3241	7469	7469	53457	53448	85759	85685			39305	39305	18352	18352	27537	27537	6703	6703			52418	52405	3425	3419
A5	1379	1379			21219	21208	465	465					6077	6077			1098	1098			929	929	2851	2687
E1																								
G1			85	104			1585	1585					1482	1588					563	563			521	1853
G2	1112	1133	986	1787		166			232	232			336	351	1257	1317	10	10	401	426	85	85	1007	1061
G3			8	8		5			22	22									40	40				
H2	11045	11045	37566	37566	395	395	41779	41779	2674	2674	23631	23631	242	242	15867	15807	11833	11833	4737	4737	1686	1686	7418	7213
H3	79	79	626	626	356	356	15	15	47	47	465	465	516	516			396	396	191	191	1003	1003	5403	5403
Total	38835	38821	112447	112447	191860	191828	251582	251414	31245	31232	248115	248115	110221	110147	134280	134280	48122	48122	30409	30409	140701	140678	67963	67927

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Chhattisgarh State

Area in hectares

LD Class	DISTRICTS																							
	JASHPUR		KANKER		KAWARDHA		KONDAGAON		KORBA		KOREA		MAHASAMUND		MUNGELI		NARAYANPUR		RAIGARH		RAIPUR		RAJ NANDGAON	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	1261	1261	445	445			82	82	1872	1872	260	260	12946	12946	311	311	840	840	6753	6726	321	321	3053	3131
A2	73672	73645	118706	118638	17556	17556	103800	103800	97748	97139	134865	134861	38535	38474	24768	24768	48574	48574	105912	104199	32298	32022	123548	123453
A3	103862	103862	27786	27786	51666	51666	27221	27221	36978	36966	19840	19840	30037	30037	26992	26992	20441	20441	107634	107017			75725	75725
A5	5577	5577	9215	9215	1512	1512	423	423	10183	10126	9260	9260	882	882	6196	6196			3927	3927			918	918
E1							59	59											35	35				
G1									1885	2352									3476	3791	3563	3595		
G2		27	4	72					5272	5483	1669	1549	174	211					1240	2847	839	1083	182	182
G3																					131	153		
H2	3737	3737	11508	11508	2036	2036	12413	12413	6958	6958	10062	10062	27005	27005	47	47	46210	46210	34203	34106	11496	11496	9697	9697
H3	360	360	112	112			165	165	786	786	403	403	436	436	38	38	6	6	1377	1377	54	54	157	157
Total	188469	188469	167776	167776	72770	72770	144163	144163	161682	161682	176359	176235	110015	109991	58352	58352	116071	116071	264557	264025	48702	48724	213280	213263

LD Class	DISTRICTS							
	SUKMA		SURAJPUR		SURGUJA		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	303	303	1214	1214	89	89	45774	45825
A2	197284	197284	95213	95067	55713	55435	2148541	2142863
A3	22205	22205	37537	37537	65969	65969	951580	950828
A5			9865	9806	4926	4926	96902	96611
E1							94	94
G1			53	112	5	5	13218	15548
G2			3210	3356	19	297	18035	21675
G3							201	228
H2	5219	5219	778	778	3084	3084	343326	342964
H3	101	101	186	186	39	39	13317	13317
Total	225112	225112	148056	148056	129844	129844	3630988	3629953

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Raigarh District (264025 ha, 37.3% of district TGA)

Maximum changes in land degradation:-Raigarh District (-532 ha, 0.02% of Total LD area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF GOA
2015-16

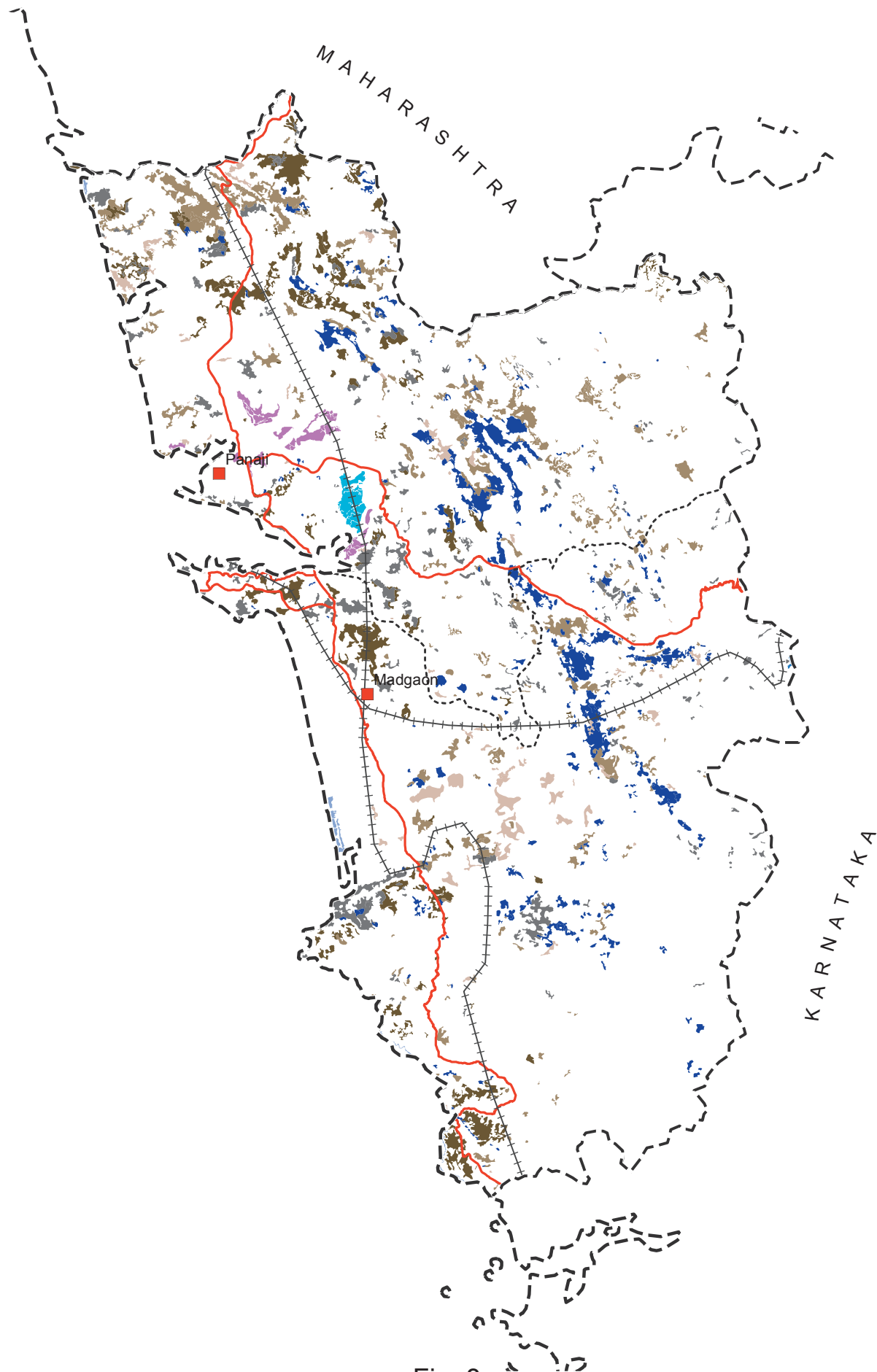
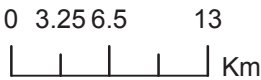


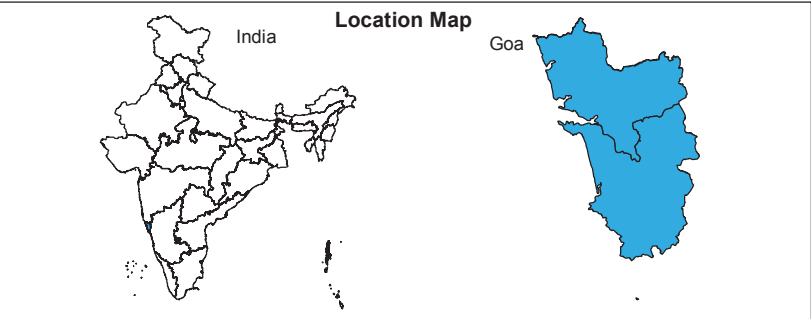
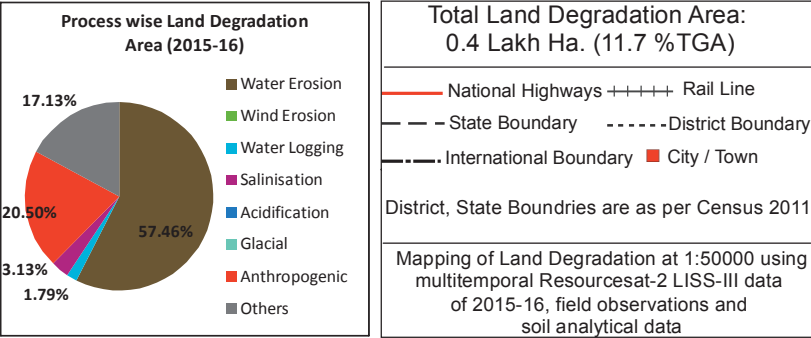
Fig. 8



LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		3113
2		A2	Sheet erosion - Moderate		11815
3		A3	Sheet erosion - Severe		9804
4		A4	Rills		
5		A5	Gullies		
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		769
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		1347
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		37
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		
24		G2	Mining and dump areas		8823
25		G3	Brick kiln		
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		7074
28		H3	RiverineSands/Sea Ingress etc		

Note: White colour in map indicates either no apparent degradation or normal land.



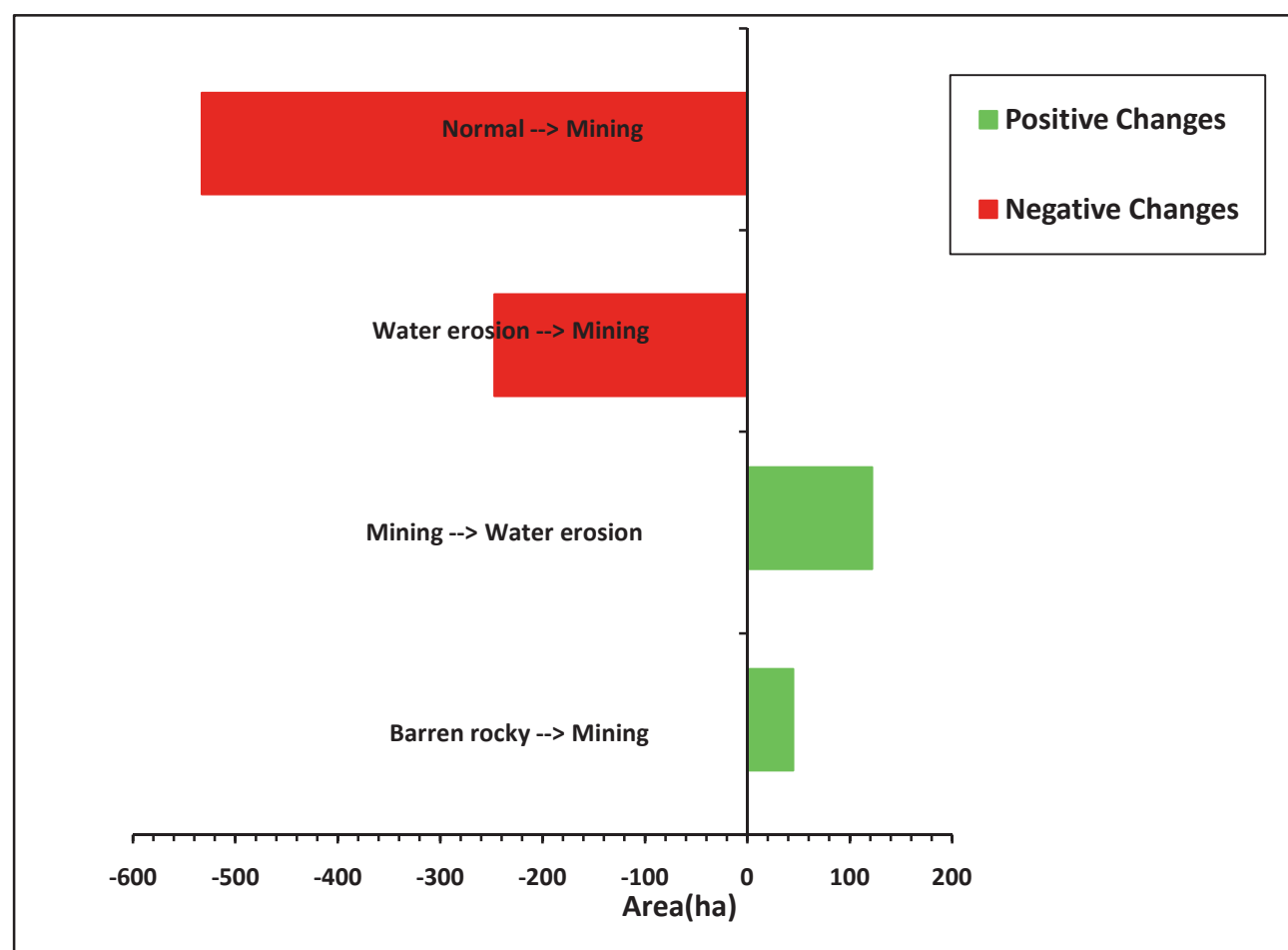
Project Execution	Regional Coordination	Partner Institution(s)
Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037

**Table 19: Change matrix of land degradation classes in Goa State
(during 2005-06 and 2015-16)**

Area in hectares

		2015-16											
	LD Class	A1	A2	A3	C2	D1	D2	E1	G2	H2	H3	Class Total (2005-06)	Total LD area in 2005-06
2005-06	A1	3064										3064	42548
	A2		11742						137			11879	
	A3			9804					110			9914	
	C2				769							769	
	D1					240						240	
	D2						1107					1107	
	E1							37				37	
	G2	49	73						7998			8120	
	H2								45	7074		7119	
	H3										299	299	
	N								533			533	
	Class Total (2015-16)	3113	11815	9804	769	240	1107	37	8823	7074	299		
	Total LD area in 2015-16	43081											

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 0 ha (0%)
 *Normal land to Land degradation: (+) 533 ha (0.25 %)
 *Net increase: (+) 533ha (0.25 %)
 # Percentage is w.r.t LD of Goa State during 2005-06

Green Denotes Land degradation to Normal land
 Red Denotes change from Normal land to Land degradation
 Black Denotes no change in Land degradation class
 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 20: Category - wise distribution of land degradation in different districts of Goa State

Area in hectares

	DISTRICTS					
LD Class	NORTH GOA		SOUTH GOA		Total	
	05-06	15-16	05-06	15-16	05-06	15-16
A1	976	1025	2088	2088	3064	3113
A2	8220	8293	3659	3522	11879	11815
A3	5890	5780	4024	4024	9914	9804
C2	769	769			769	769
D1	240	240			240	240
D2	1107	1107			1107	1107
E1			37	37	37	37
G2	3961	4102	4159	4721	8120	8823
H2	3614	3614	3505	3460	7119	7074
H3	36	36	263	263	299	299
Total	24813	24966	17735	18115	42548	43081

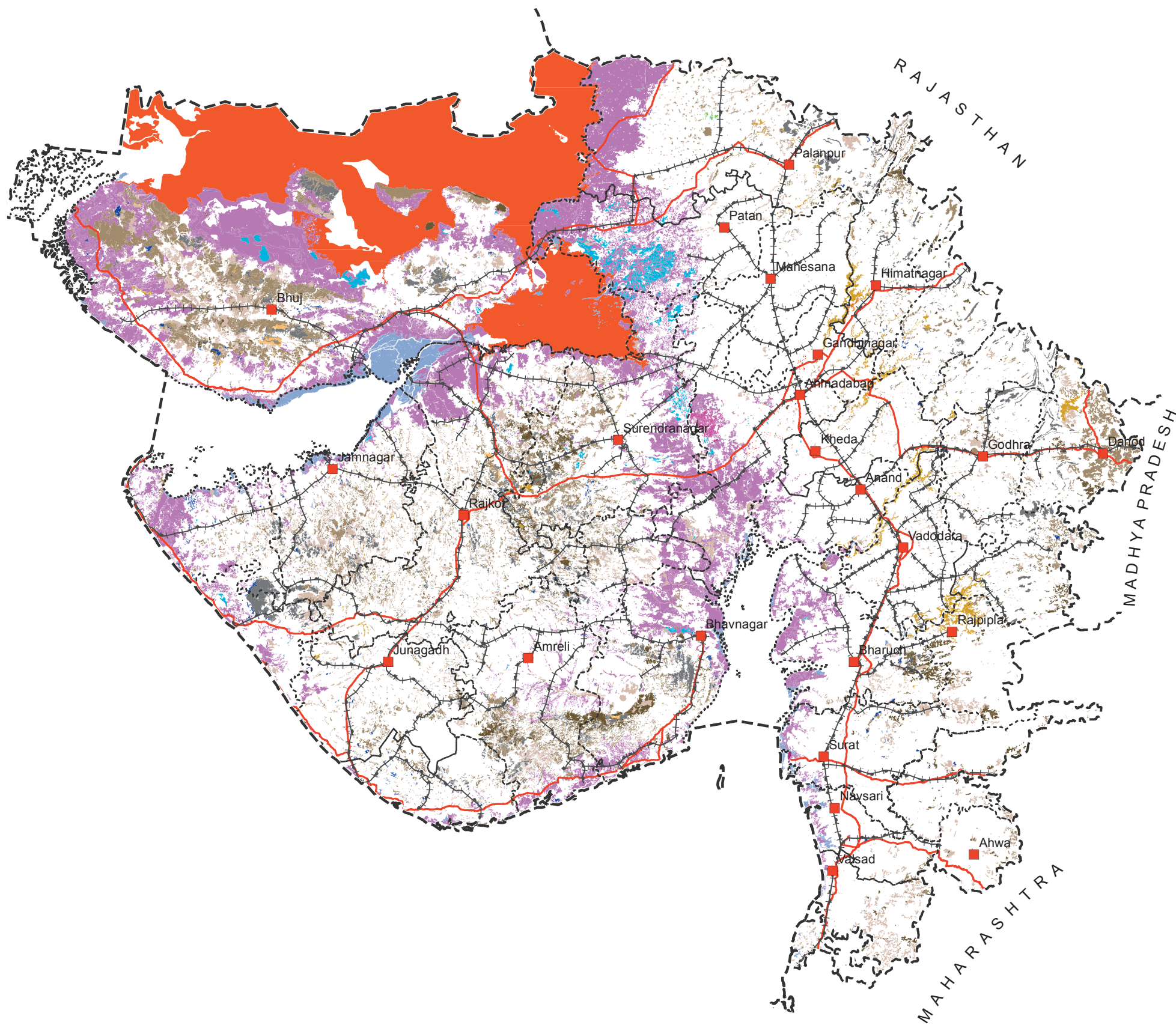
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in North Goa District (24966 ha, 14.4% of district TGA)

Maximum changes in land degradation:-South Goa District (+380 ha, 0.9% of Total LD area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF GUJARAT
2015-16

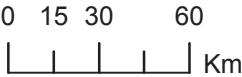
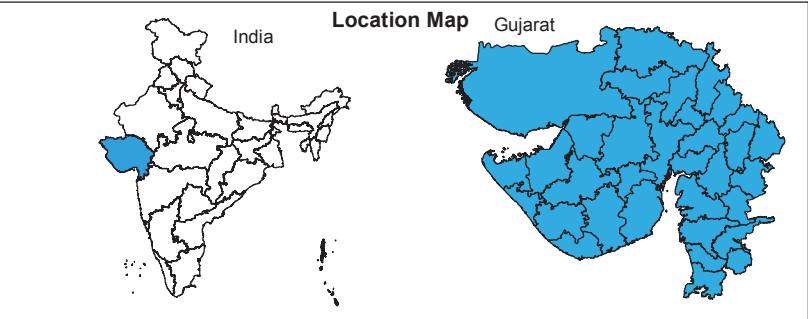
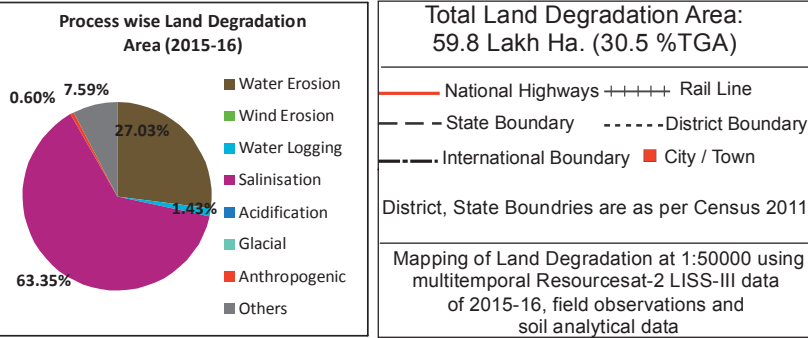


ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		518280
2		A2	Sheet erosion - Moderate		815041
3		A3	Sheet erosion - Severe		184152
4		A4	Rills		7577
5		A5	Gullies		89214
6		A6	Ravines-Shallow		4445
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		671
9		B2	Sheet erosion - Moderate		643
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		14
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		85339
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		2052763
17		D4-D6	Sodic - Slight/Moderate/Severe		12706
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		1765
19		D10	Rann		1726143
20	Acidification	E1/E2	Acidic - Moderate/Severe		
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		1678
24		G2	Mining and dump areas		32456
25		G3	Brick kiln		1511
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		283674
28		H3	RiverineSands/Sea Ingress etc		170826

Note: White colour in map indicates either no apparent degradation or normal land.



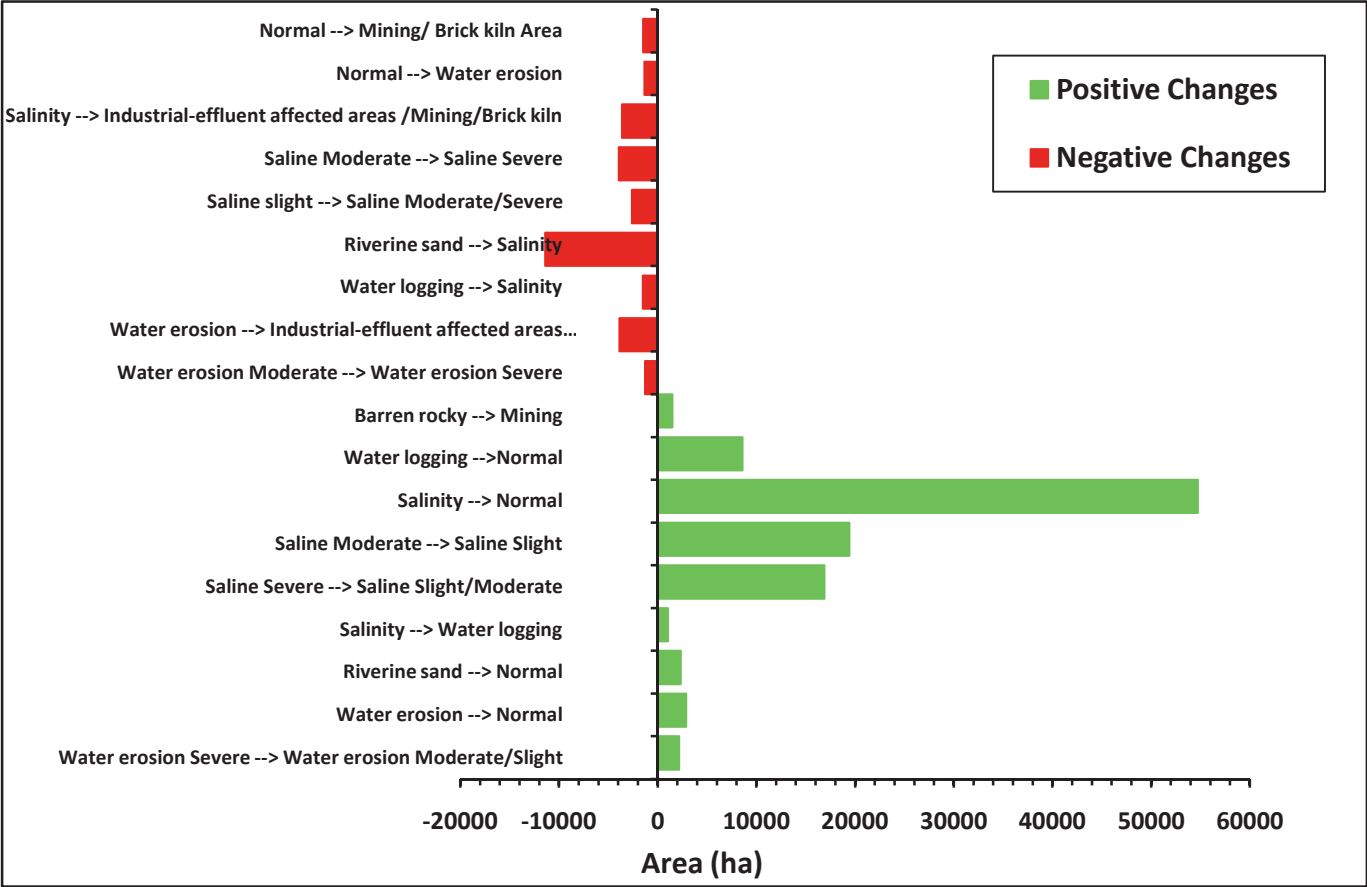
Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination Regional Remote Sensing Centre – West, CAZRI Campus, Jodhpur-342003	Partner Institution(s) Birla Institute of Scientific, Research, Statue circle, Jaipur-302001
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Table 21: Change matrix of land degradation classes in Gujarat State
(during 2005-06 and 2015-16)

Area in hectares

		2015-16																											
	LD Class	A1	A2	A3	A4	A5	A6	B1	B2	B4	C1	C2	D1	D10	D2	D3	D4	D7	D8	D9	G1	G2	G3	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06	
2005-06	A1	516661																				576	55		24	548	517864	6054571	
	A2		813364	1298																	59	2315	40			1618	818694		
	A3	524	1654	182548																	141	495				132	185494		
	A4	67	14		7577																					43	7701		
	A5					89214															28	145	23			514	89924		
	A6						4445																			30	4475		
	B1							405																			405		
	B2							222	643																	108	973		
	B4									14																			14
	C1										80190	78										133				7917	88318		
	C2											168	3616	1210		295										683	5972		
	D1											1023	29	996548		2293	329					274	1481	118		21066	1023161		
	D10														1726143														1726143
	D2													19436		784777	3932					63	1296	4		27030	836538		
	D3													8284		8630	215627					3	351	30		6660	239585		
	D4																	12706											12706
	D7																		1254										1254
	D8																			133									133
	D9																				378								378
	G1																					1110							1110
	G2																						22749	16					22765
	G3																							1169		83	1252		
	H2	2																				1492		283674					285168
H3													457		506	10439								170802	2340	184544			
N	1026	9	306					44			228	7									1423	56					3099		
Class Total (2015-16)	518280	815041	184152	7577	89214	4445	671	643	14	81609	3730	1025935	1726143	796501	230327	12706	1254	133	378	1678	32456	1511	283674	170826	68772				
Total LD area in 2015-16	5988898																												

Significant land degradation changes between 2005-06 and 2015-16



•Land degradation to Normal land : (-) 68772 ha (1.14 %) Green Denotes Land degradation to Normal land
•Normal land to Land degradation: (+) 3099 ha (0.05 %) Red Denotes change from Normal land to Land degradation
•Net decrease: (-) 65673 ha (1.08 %) Black Denotes no change in Land degradation class
Percentage is w.r.t. LD of Gujarat State during 2005-06 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 22: Category - wise distribution of land degradation in different districts of Gujarat State

Area in hectares

LD Class	DISTRICTS																							
	AHMADABAD		AMRELI		ANAND		ARAVALLI		BANAS KANTHA		BHARUCH		BHAVNAGAR		BOTAD		CHHOTA UDAIPUR		DAHOD		DEVBHOOMI DWARKA		GANDHINAGAR	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	20034	20021	24428	24426	1801	1777	1193	1193	21886	21886	10710	11175	19872	19865	17927	17927	5952	5952	6824	6824	8430	8430	2122	2122
A2	2011	2005	47972	47803	780	780	11037	11037	25168	25101	3032	3032	24945	25671	13413	13401	20469	20478	65481	65469	10954	10954	1717	1717
A3	578	578	23592	23640	110	110	2496	2496	1661	1623	15834	15661	25833	25021	80	76	7320	7320	6652	6652	53	53	14	14
A4													558	558										
A5	119	119	217	217	3546	3531	3824	3819	4222	4149	515	515					5279	5279	7306	7306			7357	7326
A6							211	204									10	10					958	951
B1	7	7									374	596												
B2											973	643												
B4											14	14												
C1	4008	1537	858	72		5			939	939	299	279	1003	1729	4	4					227	265		
C2	2116	386										78	244	273							37	37		
D1	92859	100191	36954	35950	15408	15432			12273	12273	40940	43640	54993	53913	16502	16377					61180	58824		
D10																								
D2	55782	46065	12887	11254	3308	3204			202221	202213	11874	9577	50108	44361	16912	13758					9827	9526		
D3	11173	4002	6529	6075	2432	1672					18560	17986	23001	21779	2253	1974					21712	21628		
D4	12608	12608											43	43										
D7	322	322							80	80														
D8	23	23	3	3							4	4												
D9																								
G1																								
G2	59	100	897	1071			822	916	514	559	518	1194	245	1419	202	211	600	612	17	44	2632	3374		
G3	355	491			3	18			48	53	16	16	66	101					6	16			403	325
H2	1	1	17665	17577			6513	6513	19118	19118	1433	1433	25238	24877	5647	5646	10153	10153	11023	11023	12255	12191		
H3	3360	3083	3	3	2112	2061			193	191	7042	6740	5886	5319			66	31	47	47	5182	4929	20	20
Total	205415	191539	172005	168091	29500	28590	26096	26178	289684	289438	110777	111330	232035	224929	72940	69374	49849	49835	97356	97381	132489	130211	12591	12475

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Gujarat State

Area in hectares

LD Class	DISTRICTS																							
	GIR SOMNATH		JAMNAGAR		JUNAGADH		KACHCHH		KHEDA		MAHESANA		MAHISAGAR		MORBI		NARMADA		NAVSARI		PANCHMAHAL		PATAN	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	4318	4318	43898	43595	12998	12998	125216	125133	4342	4342	3224	3365	1801	1801	20023	19978	12451	12451	3202	3127	10536	10536	5661	5629
A2	12121	12001	50557	50354	21740	21547	281965	280454	4501	4385	1864	1911	5427	5427	28383	27495	2922	2937	2774	2774	7007	7005	1994	1983
A3	1049	1142	667	776	1093	1078	8471	8771	1439	1298	2323	2060	551	551	9348	9480	11950	12172			2640	2549		
A4			14	14			4659	4659							1713	1713	25	25			9	9		
A5			749	749	700	700	2703	2687	6152	6073	3415	3415	924	924	1136	1136	13804	13695	21	21	120	120	159	159
A6									712	706														
B1																					24	68		
B2																								
B4																								
C1	69	5	62	62	308		15592	15695	723	130					1300	1044			79	79	35		46738	46770
C2			431	431			5	12							4	4								
D1	5606	5953	15510	13902	8102	7202	384662	386646	1099	1501	189	189			109275	107721			3193	3405			47364	47337
D10							1726143	1726143																
D2	4530	3349	5157	4731	1351	76	237326	228167	1434	273					7559	7183			1210	1302			132203	132202
D3	4489	4128	9762	9425	432	129	107241	104122	6						10467	16602			3364	3365			4164	4164
D4	3	3									52	52												
D7																								
D8			15	15																				
D9																								
G1	310	310	21	21	48	88	415	724		141					96	146								
G2	1437	1706	981	1412	1095	1324	5001	7979	430	430	28	103	155	155	781	1294	9	57	749	776	319	470		
G3									39	50	26	26	7	7			6	6			13	17	198	277
H2	4677	4631	23509	23441	910	910	50423	49966			536	536	11365	11365	7891	7769	464	464	81	81	9298	9298		
H3	1045	1045	18820	18583	9	9	87383	83066	14	14	40	37	16	16	30393	23973	151	151	7334	6758	47	25	1236	1236
Total	39654	38591	170153	167511	48786	46061	3037205	3024224	20891	19343	11697	11694	20246	20246	228369	225538	41782	41958	22007	21688	30048	30097	239717	239757

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Gujarat State

Area in hectares

LD Class	DISTRICTS																			
	PORBANDAR		RAJKOT		SABAR KANTHA		SURAT		SURENDRANAGAR		TAPI		THE DANGS		VADODARA		VALSAD		TOTAL	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	6097	6044	26136	26062	5920	5989	13454	13713	26954	26946	9797	9819	6388	6388	7525	7525	26744	26923	517864	518280
A2	1399	1399	64349	62908	20894	20977	2099	2023	71033	71319	1667	1672	3215	3219	3279	3279	2525	2524	818694	815041
A3			5092	5415	10269	10140	3041	3026	28966	28478	6510	6477	2042	2038	887	900	4933	4557	185494	184152
A4					305	181			418	418									7701	7577
A5			1291	1277	9047	8894			2464	2458					14807	14598	47	47	89924	89214
A6					2235	2225			349	349									4475	4445
B1																			405	671
B2																			973	643
B4																			14	14
C1	3326	1146	27	27		3	178	178	12467	11618					55	1	21	21	88318	81609
C2	19	19							3010	2482					3	3	103	5	5972	3730
D1	21456	18979	204	208			3299	4178	90088	90073					1154	1178	851	863	1023161	1025935
D10																			1726143	1726143
D2	7416	5680	361	357			3179	2462	71825	70729					56	32	12		836538	796501
D3	2340	2235					6082	6119	5071	4415							507	507	239585	230327
D4																			12706	12706
D7	46	46					806	806											1254	1254
D8									88	88									133	133
D9	378	378																	378	378
G1	2	2	3	3		28			215	215									1110	1678
G2	1111	1513	1032	1460	85	251	1075	1633	1022	1298	601	607			269	403	79	85	22765	32456
G3	10	10			12	19	44	60								3		16	1252	1511
H2	18746	18498	18465	18441	6786	6784			22217	22204	333	333			264	264	157	157	285168	283674
H3	281	281	169	169	253	238	8166	7818	1036	1036					1202	1196	3038	2751	184544	170826
Total	62627	56230	117129	116327	55806	55729	41423	42016	337223	334126	18908	18908	11645	11645	29501	29382	39017	38456	6054571	5988898

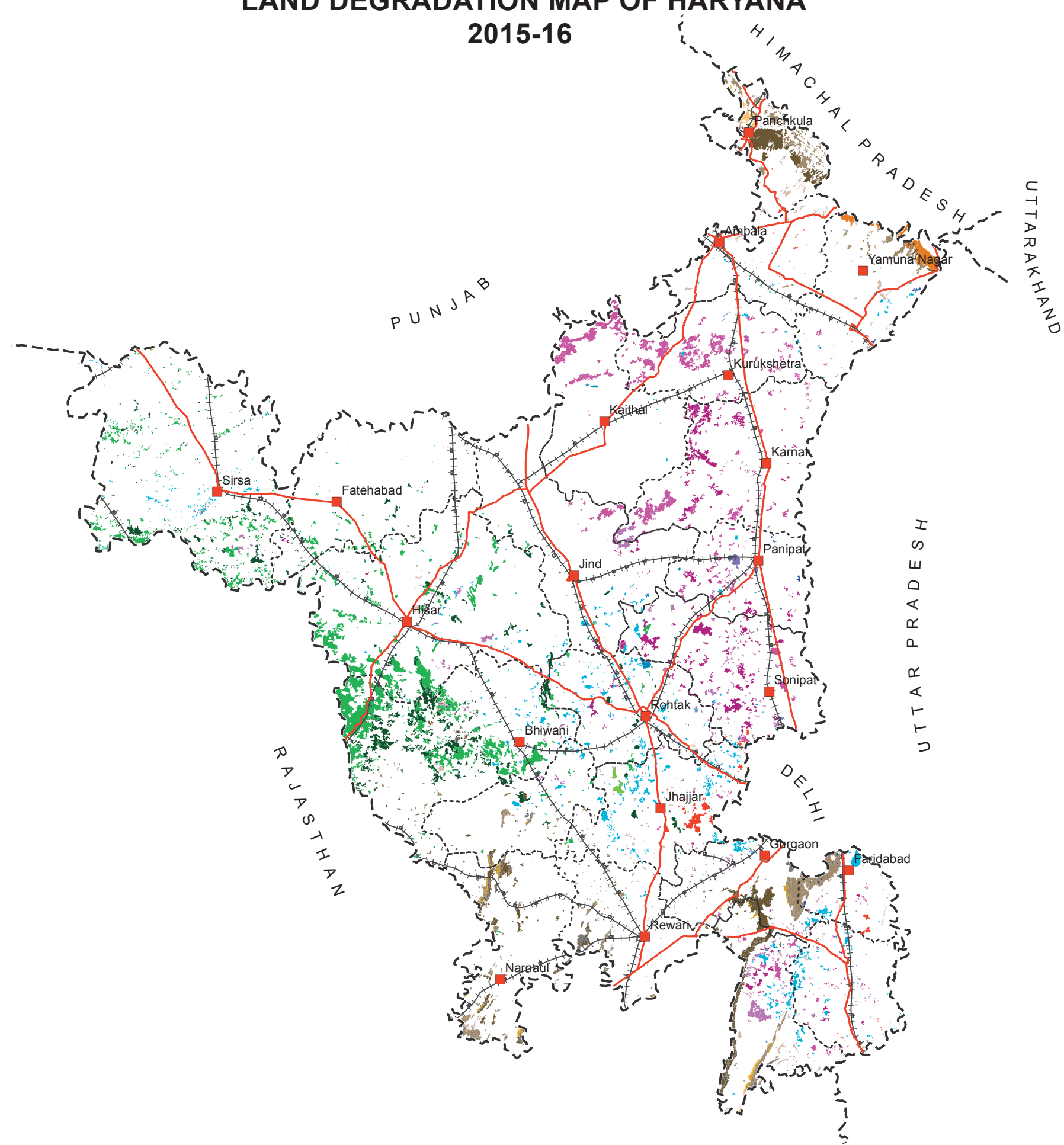
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Kachchh District (3024244 ha, 66.2 % of district TGA)

Maximum changes in land degradation:-Ahmadabad District (-13876 ha, 0.2% of Total LD area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF HARYANA
2015-16



ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		10555
2		A2	Sheet erosion - Moderate		39295
3		A3	Sheet erosion - Severe		44026
4		A4	Rills		1315
5		A5	Gullies		3791
6		A6	Ravines-Shallow		7971
7		A7	Ravines-Deep		157
8	Wind Erosion	B1	Sheet erosion - Slight		758
9		B2	Sheet erosion - Moderate		1357
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		38617
12		B5	Partially Stablized Dunes		90320
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		33744
15		C3	Subsurface waterlogged		1516
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		17555
17		D4-D6	Sodic - Slight/Moderate/Severe		48587
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		29710
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		1586
24		G2	Mining and dump areas		1408
25		G3	Brick kiln		6084
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		10315
28		H3	RiverineSands/Sea Ingress etc		554

Note: White colour in map indicates either no apparent degradation or normal land.

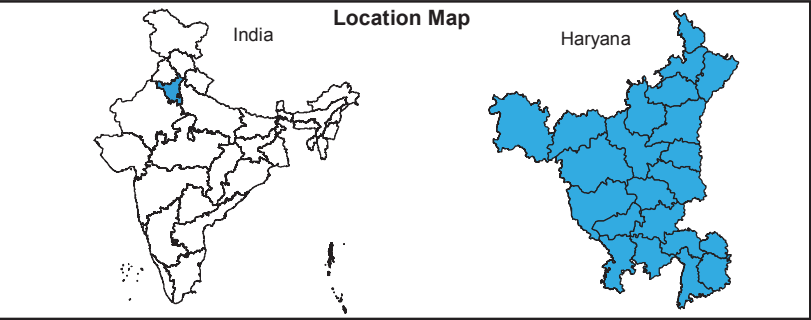
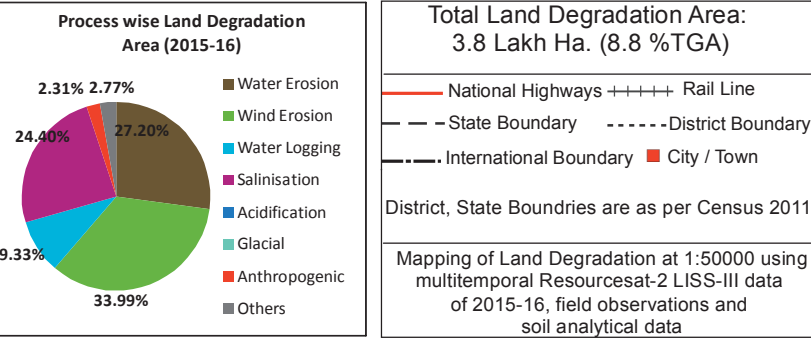


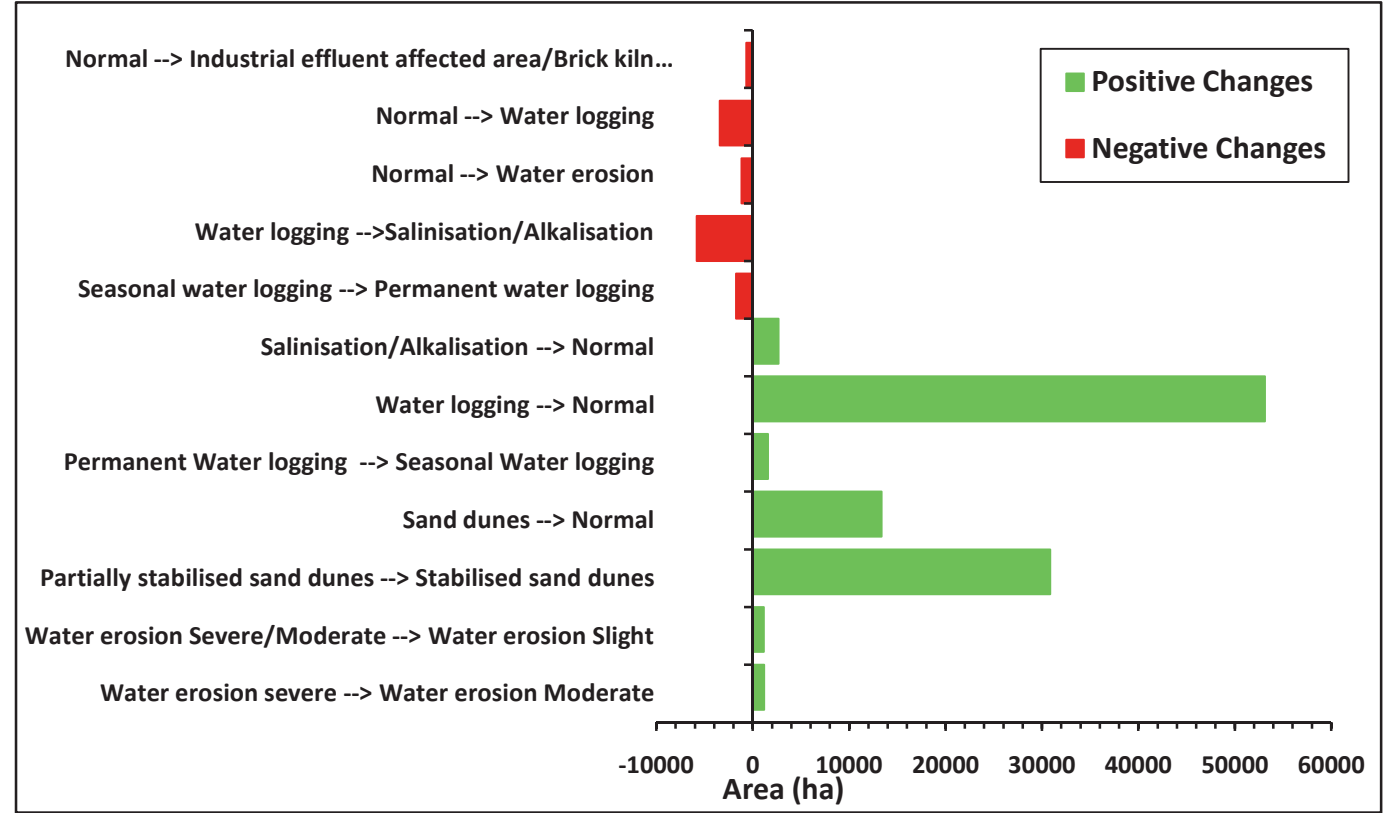
Fig. 10

Table 23: Change matrix of land degradation classes in Haryana State
(during 2005-06 and 2015-16)

Area in hectares

		2015-16																																
	LD Class	A1	A2	A3	A4	A5	A6	A7	B1	B2	B4	B5	C1	C2	C3	D1	D2	D3	D4	D5	D6	D7	D8	D9	G1	G2	G3	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06		
2005-06	A1	8243																								11					8254	453299		
	A2	309	38097																							4				48	38458			
	A3	834	1198	44026																										59	46117			
	A4				1315																										1315			
	A5					3791																									3791			
	A6						7971																										7971	
	A7							157																									157	
	B1								716																						77		793	
	B2									1290																							1290	
	B4										7745	54																			2161		9960	
	B5								42	67	30872	90266																			11137		132384	
	C1												24502	1735	27	1481	542	276					796								45885		75244	
	C2													1582	2241		83	2040									48				7245		13341	
	C3													45		1489	82		143					162	124								2045	
	D1																4755																232	4987
	D2													84				7528															553	8165
	D3																		768															768
	D4													31						28391														28422
	D5																				17530												618	18148
	D6																					2523												2523
	D7													80									16706		124								1113	18023
	D8												29											10713									179	10921
	D9																								927									927
	G1																									1483								1483
	G2																										1393							1393
	G3																											5526						5526
H2																												10315				10315		
H3																													554	24		578		
N		1169											3195	220										56	103		510					5253		
	Class Total (2015-16)	10555	39295	44026	1315	3791	7971	157	758	1357	38617	90320	29548	4196	1516	6401	10110	1044	28534	17530	2523	17502	10875	1333	1586	1408	6084	10315	554	69331				
	Total LD area in 2015-16	389221																																

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 69331 ha (15.29%)				Green Denotes Land degradation to Normal land			
*Normal land to Land degradation: (+) 5253 ha (1.16%)				Red Denotes change from Normal land to Land degradation			
*Net decrease: (-) 64078 ha (14.14%)				Black Denotes no change in Land degradation class			
# Percentage is w.r.t. LD of Haryana State during 2005-06				Blue Denotes inter-class change			
A1	Water erosion - Sheet - Slight	D4	Sodic - Slight				
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate				
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe				
A4	Water erosion - Rills	D7	Saline Sodic - Slight				
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate				
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe				
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann				
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate				
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe				
B3	Wind erosion - Sheet - Severe	F1	Frost heaving				
B4	Wind erosion - Stabilized dunes	F2	Frost shattering				
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas				
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas				
C1	Surface ponding - Seasonal	G3	Brick kiln areas				
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage				
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste				
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas				
D2	Saline - Moderate	N	Normal				
D3	Saline - Severe						

Table 24: Category - wise distribution of land degradation in different districts of Haryana State

Area in hectares

LD Class	DISTRICTS																							
	AMBALA		BHIWANI		DADRI		FARIDABAD		FATEHABAD		GURGAON		HISAR		JHAJJAR		JIND		KAITHAL		KARNAL		KURUKSHETRA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	662	1081	602	1049		32	526	526	16	16	123	227	635	635	537	537	62	62	68	68			32	32
A2	207	207	1106	1091	1636	1636	7469	7469	17	17	5659	5645	30	30	857	857								
A3			1163	1043	1314	1282					6886	6881			70	70								
A4											49	49												
A5					305	305					432	432												
A6																								
A7																								
B1									6				49	85	55	55								
B2			15	15											1187	1187								
B4			184	19790	54	1050			1232	1859		26	1722	5855	1214	1214		530						
B5			62075	40284	1674	656			5768	3106	41	15	32014	26714	735	735	1156	445						
C1	328	269	6432	2070	3051	1617	2208	2211	301	63	1242	1072	5746	1228	10534	6387	2804	1246	267	122	219		481	454
C2	17		737	314	53	34	30	86	124	9	107	110	617	234	1173	927	18	88						
C3		4												11			177	177	179	179			91	95
D1												77	89	759			914	914			1597	1816		23
D2			605	605	303	303	190	190			1101	914	215	215	690	690	87	87						
D3												25		251										
D4															37	37	1927	1927	7727	7727	5803	5803	9622	9622
D5							261	261			144	144	54	54	350	350	307	307	2774	2774	2262	2262	5709	5709
D6																	24	24	160	160	627	627	154	154
D7															80	80	437	437	66	66	7165	7165	1	1
D8							86	86			58	58			164	164	245	245			2704	2704	199	199
D9			15	92					163	163	19	19		81	9	9					165	165		
G1									16	16							48	48						
G2			171	171	45	45	478	478			33	37									32	32		
G3	120	248	17	17			260	579	48	48			8	8	4124	4124	19	19	8	8	17	17		
H2			286	286	568	568	409	409			1616	1616												
H3	103	103					14	14													17	17	154	154
Total	1437	1912	73408	66827	9003	7528	11931	12309	7685	5303	17510	17347	41179	36160	21816	17423	8225	6556	11249	11104	20608	20608	16443	16443

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Haryana State

Area in hectares

LD Class	DISTRICTS																					
	MAHENDRAGARH		MEWAT		PALWAL		PANCHKULA		PANIPAT		REWARI		ROHTAK		SIRSA		SONIPAT		YAMUNANAGAR		TOTAL	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	21	829	1045	1284	545	545	1653	1738				178	79	79	11				1637	1637	8254	10555
A2	4714	5175	2741	2786			7579	7910			3377	3333							3066	3139	38458	39295
A3	8738	7410	11529	11484	48	48	13384	13053			1619	1462							1366	1293	46117	44026
A4	115	115	899	899			252	252													1315	1315
A5	1567	1567	1487	1487																	3791	3791
A6							185	185											7786	7786	7971	7971
A7																			157	157	157	157
B1	17	17													672	595					793	758
B2															88	155					1290	1357
B4		5											2167	2264	3387	6024					9960	38617
B5	176	86											2318	1397	25996	16451	431	431			132384	90320
C1	58	33	3163	1525	2094	2602			411	337	670	172	15760	4401	16655	1821	2096	1366	724	552	75244	29548
C2	15	9	3138	1072	100	642					14	8	733	427	6259	77	91	29	115	130	13341	4196
C3									117	117			809	809			548		124	124	2045	1516
D1			69	202						74		12	213	139			2105	2385			4987	6401
D2			1814	4104	1006	922			20	20			1228	1233	363	363	543	464			8165	10110
D3			126	126	43	43									211	211	388	388			768	1044
D4			1497	1497	44	44			481	481			198	198			810	922	276	276	28422	28534
D5			2229	1636	704	679			1695	1695			57	57	43	43	1559	1559			18148	17530
D6					19	19			1325	1325			43	43	11	11	160	160			2523	2523
D7			424	326					2068	1053			354	1150			7428	7224			18023	17502
D8			1307	1186	460	460			1362	1304			200	200			4136	4269			10921	10875
D9			21	21	113	113			99	99			35	35			288	536			927	1333
G1	11	11							1316	1316	77	77	4	4				103	11	11	1483	1586
G2			111	111	9	9			256	256						11			258	258	1393	1408
G3			21	21	96	159	309	309			3	3	53	53	26	74	371	371	26	26	5526	6084
H2	3292	3292	2756	2756							1388	1388									10315	10315
H3	22	22			30	30	32	32											206	182	578	554
Total	18746	18571	34377	32523	5311	6315	23394	23479	9150	8077	7148	6633	24251	12489	53722	25836	20954	20207	15752	15571	453299	389221

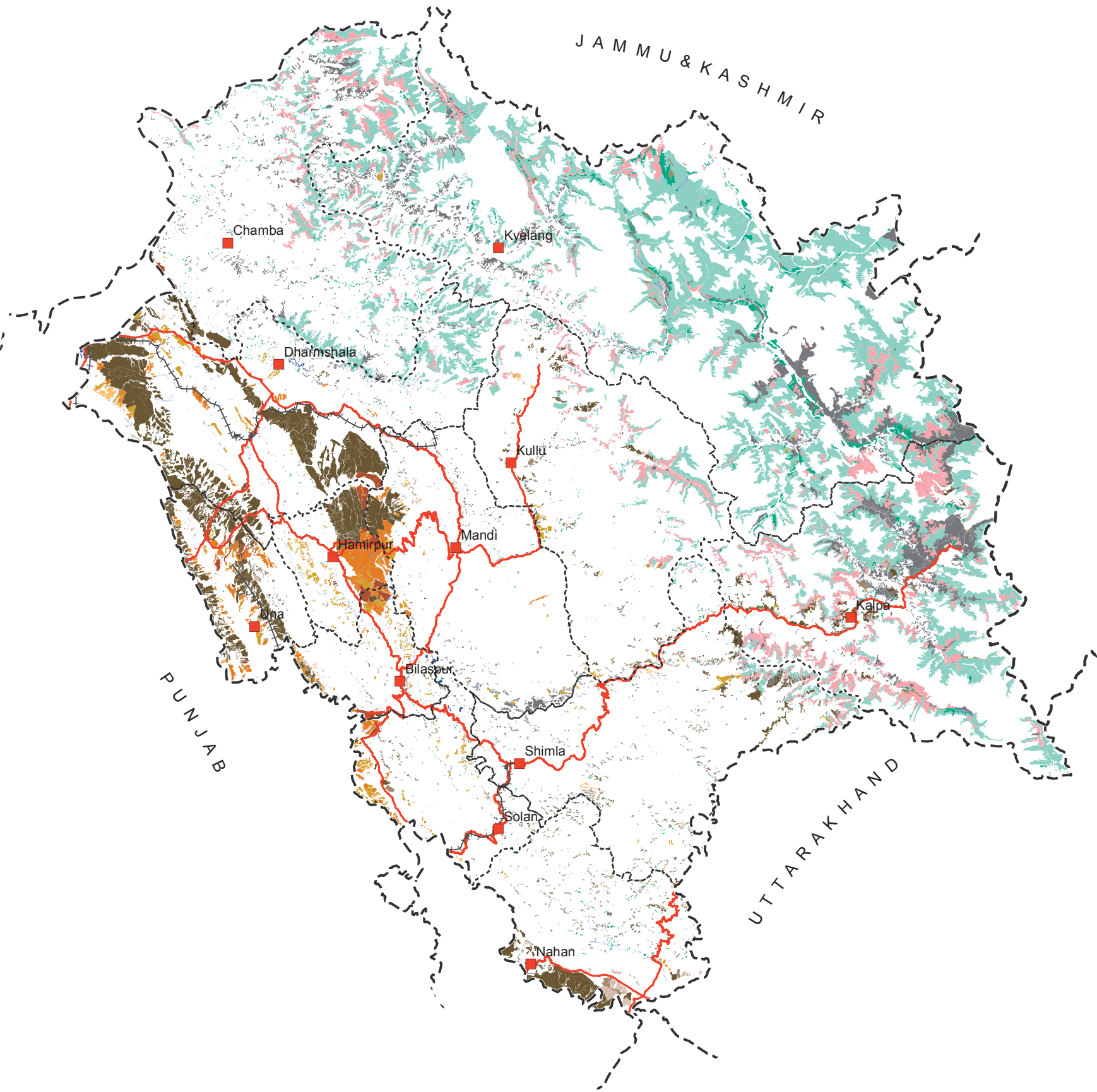
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Bhivani District (66827 ha, 13% of district TGA)

Maximum changes in land degradation:-Sirsa District (-27886 ha, 6% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF HIMACHAL PRADESH
2015-16

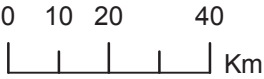
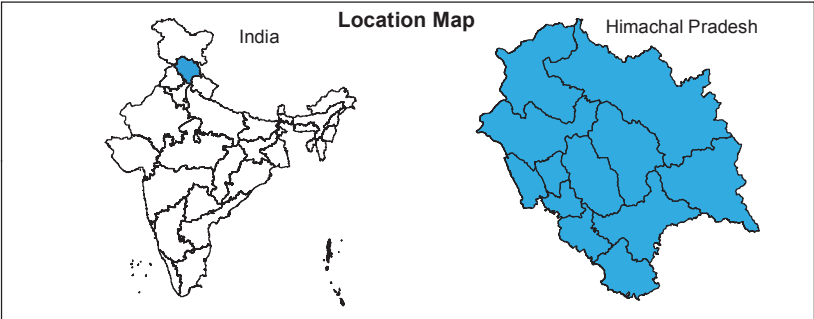
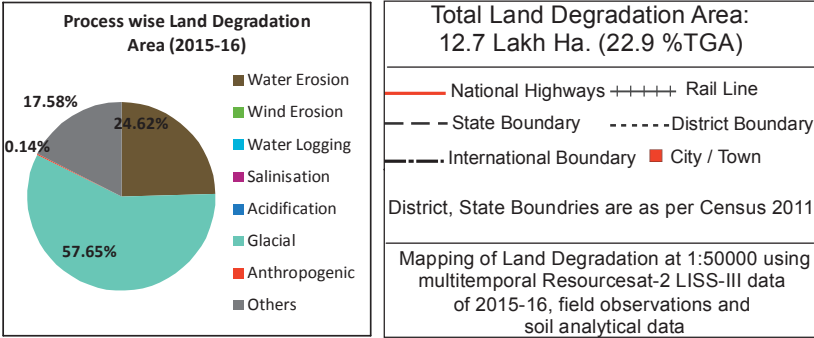


ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		8737
2		A2	Sheet erosion - Moderate		17436
3		A3	Sheet erosion - Severe		204002
4		A4	Rills		3758
5		A5	Gullies		27309
6		A6	Ravines-Shallow		40624
7		A7	Ravines-Deep		13253
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		41
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisiation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		573383
23	Anthropogenic	G1	Industrial effluent affected areas		1429
24		G2	Mining and dump areas		
25		G3	Brick kiln		
26	Others	H1	Mass movement / mass wastage		40972
27		H2	Barren rocky / Stony waste		
28		H3	RiverineSands/Sea Ingress etc		

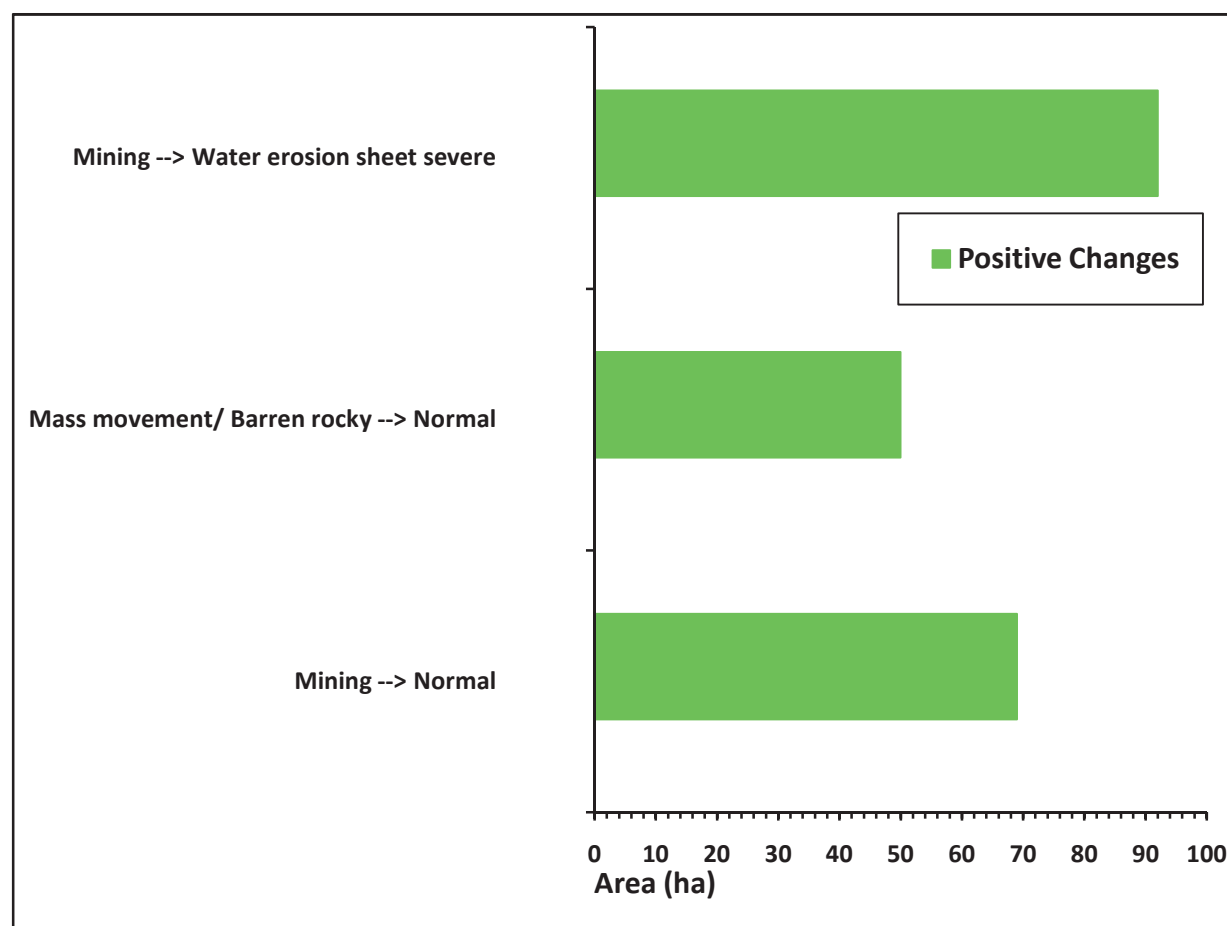
Note: White colour in map indicates either no apparent degradation or normal land.



**Table 25: Change matrix of land degradation classes in Himachal Pradesh State
(during 2005-06 and 2015-16)**

Area in hectares																			
		2015-16																	
	LD Class	A1	A2	A3	A4	A5	A6	A7	C1	C2	F1	F2	G2	G3	H1	H2	H3	N	Class Total (2005-06)
2005-06	A1	8737																	8737
	A2		17436																17436
	A3			203910															203910
	A4				3758														3758
	A5					27309													27309
	A6						40624												40624
	A7							13253											13253
	C1								4										4
	C2									37									37
	F1										164464								164464
	F2											573383							573383
	G2			92									1429					69	1590
	G3													368					368
	H1														40972			28	41000
	H2															173851		22	173873
	H3																10214		10214
	Class Total (2015-16)	8737	17436	204002	3758	27309	40624	13253	4	37	164464	573383	1429	368	40972	173851	10214	119	
	Total LD area in 2015-16	1279841																	
		1279960																	

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 119 ha (0.001%)

*Normal land to Land degradation: (+) 0 ha (0%)

*Net decrease (-) 119 ha (0.001%)

Percentage is w.r.t LD of Himachal Pradesh State during 2005-06

Green Denotes Land degradation to Normal land

Red Denotes change from Normal land to Land degradation

Black Denotes no change in Land degradation class

Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 26: Category - wise distribution of land degradation in different districts of Himachal Pradesh State

Area in hectares

	DISTRICTS																									
LD Class	BILASPUR		CHAMBA		HAMIRPUR		KANGRA		KINNAUR		KULLU		LAHUL & SPITI		MANDI		SHIMLA		SIRMAUR		SOLAN		UNA		Total	
A1	1150	1150	10	10	119	119	439	439	252	252	245	245	123	123	378	378	104	104	4357	4357	1091	1091	469	469	8737	8737
A2	979	979	24	24	14	14	514	514	3248	3248	878	878	3385	3385	1002	1002	3008	3008	3263	3263	866	866	255	255	17436	17436
A3	2048	2048	4049	4049	14888	14888	94473	94473	8266	8266	7103	7195	166	166	9959	9959	9500	9500	18688	18688	2015	2015	32755	32755	203910	204002
A4	265	265			52	52	1427	1427			593	593			494	494	699	699	80	80	137	137	11	11	3758	3758
A5	2897	2897	33	33	4495	4495	6117	6117	483	483	1760	1760	533	533	2705	2705	1568	1568	270	270	3980	3980	2468	2468	27309	27309
A6	4141	4141	8	8	15614	15614	5640	5640			285	285			3880	3880	21	21			3194	3194	7841	7841	40624	40624
A7	2604	2604	1006	1006	4686	4686	1987	1987							35	35					384	384	2551	2551	13253	13253
C1							4	4																	4	4
C2															18	18							19	19	37	37
F1			29115	29115			1455	1455	61901	61901	17314	17314	48443	48443			6236	6236							164464	164464
F2			71048	71048			24656	24656	118549	118549	20057	20057	329241	329241			9832	9832							573383	573383
G2	209	143	38	38			722	722			92				89	86			133	133	307	307			1590	1429
G3															25	25					146	146	197	197	368	368
H1	51	51	3189	3189	31	31	1255	1255	5167	5167	770	748	28024	28024	260	260	1139	1139	928	928	161	155	25	25	41000	40972
H2	1686	1672	20773	20773	494	494	5334	5334	51623	51623	3611	3603	71215	71215	6376	6376	7812	7812	3143	3143	1060	1060	746	746	173873	173851
H3	215	215	1112	1112	815	815	3166	3166	591	591	382	382	2465	2465	248	248	241	241	465	465	279	279	235	235	10214	10214
Total	16245	16165	130405	130405	41208	41208	147189	147189	250080	250080	53090	53060	483595	483595	25469	25466	40160	40160	31327	31327	13620	13614	47572	47572	1279960	1279841

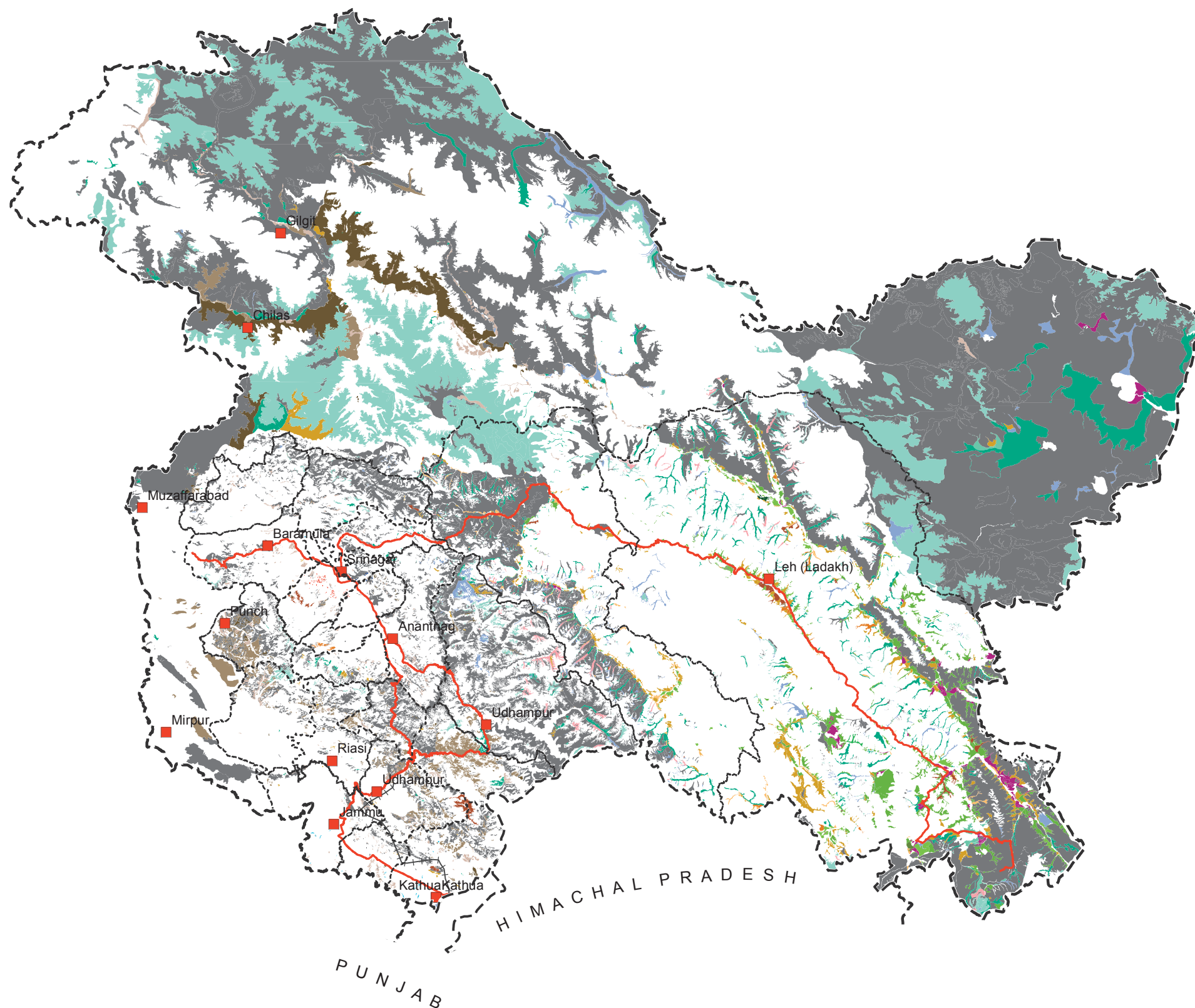
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Lahul & Spiti District (483595 ha, 35% of district TGA)

Maximum changes in land degradation:-Bilaspur District (-80 ha, 0.01% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF JAMMU AND KASHMIR 2015-16

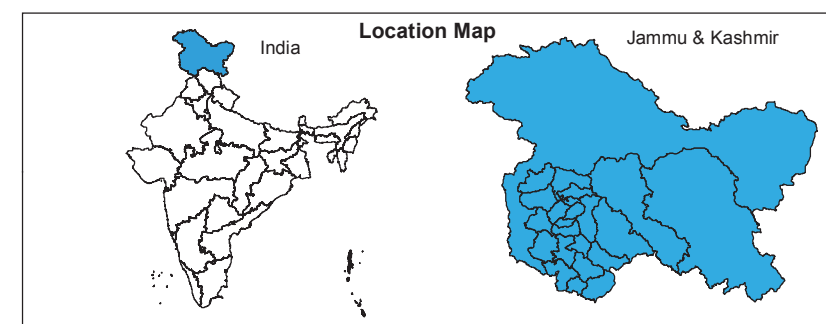
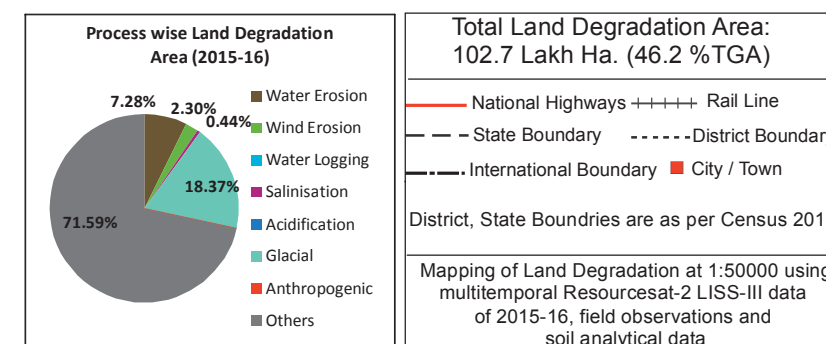


ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		91047
2		A2	Sheet erosion - Moderate		202822
3		A3	Sheet erosion - Severe		239596
4		A4	Rills		24432
5		A5	Gullies		156701
6		A6	Ravines-Shallow		9224
7		A7	Ravines-Deep		23891
8	Wind Erosion	B1	Sheet erosion - Slight		14158
9		B2	Sheet erosion - Moderate		42966
10		B3	Sheet erosion - Severe		175009
11		B4	Stablized Dunes		1011
12		B5	Partially Stablized Dunes		2117
13		B6	Un-Stablized Dunes		1339
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		1147
15		C3	Subsurface waterlogged		40
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		45599
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic - Moderate/Severe		37477
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		1849902
23	Anthropogenic	G1	Industrial effluent affected areas		276
24		G2	Mining and dump areas		
25		G3	Brick kiln		863
26	Others	H1	Mass movement / mass wastage		418771
27		H2	Barren rocky / Stony waste		6800122
28		H3	Riverine Sands/Sea Ingress etc		134328

Note: White colour in map indicates either no apparent degradation or normal land.

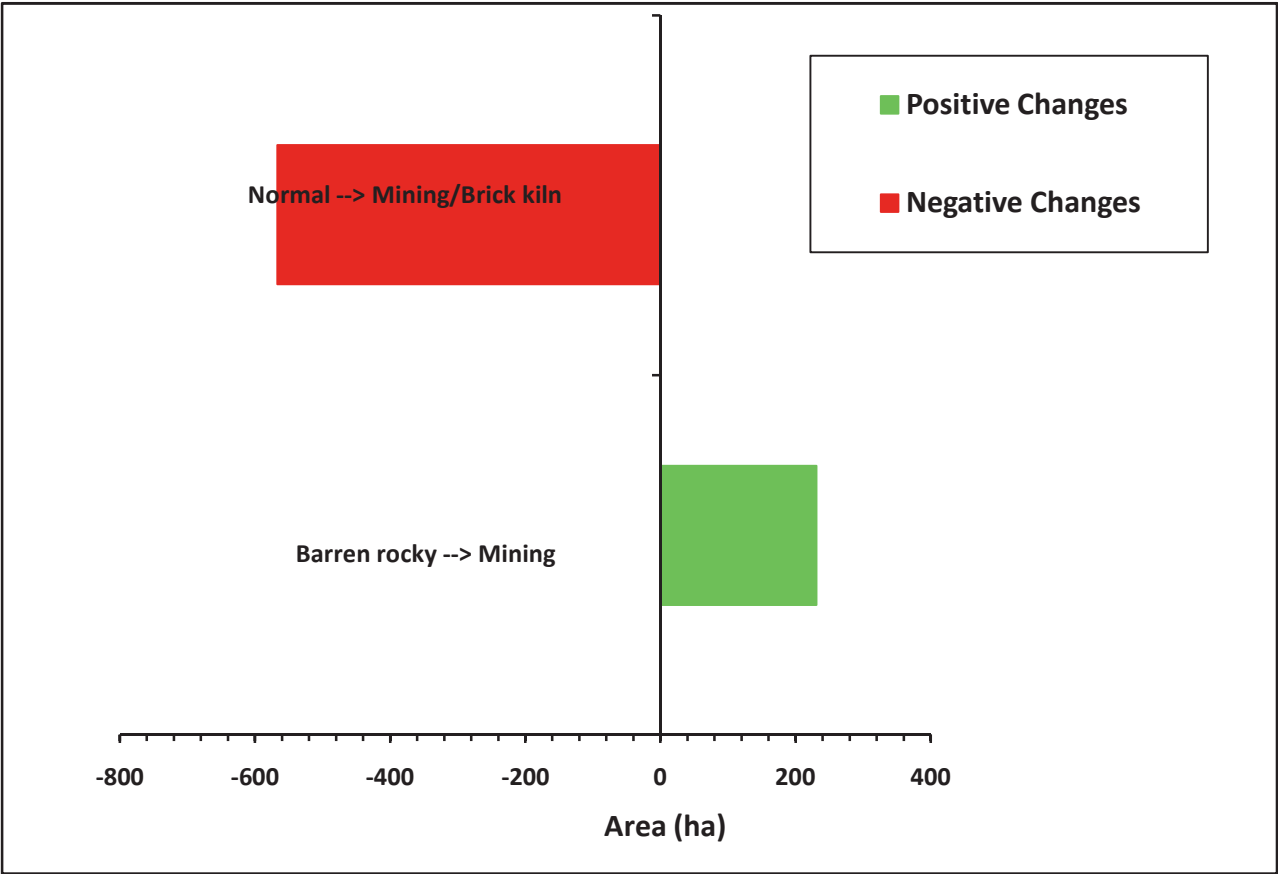


Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination Indian Institute of Remote Sensing, Kalidas road, Deharadun-240001	Partner Institution(s) Department of Ecology, Environment and Remote Sensing, Government of Jammu and Kashmir, Bemina, Srinagar – 190018
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Table 27: Change matrix of land degradation classes in Jammu and Kashmir State
(during 2005-06 and 2015-16)

		(during 2005-06 and 2015-16)																										Area in hectares		
		2015-16																												
	LD Class	A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	C1	C3	D7	D8	F1	F2	G2	G3	H1	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06		
2005-06	A1	91027																									91027	10272373		
	A2		202818																								202818			
	A3			239592																						75	239667			
	A4				24432																						24432			
	A5					156701																					156701			
	A6						9224																				9224			
	A7							23891																			23891			
	B1								14158																		14158			
	B2									42966																	42966			
	B3										175009																175009			
	B4											1011															1011			
	B5												2117														2117			
	B6													1339													1339			
	C1														1147												1147			
	C3															40											40			
	D7																	17972									17972			
	D8																		27627								27627			
	F1																			37477							37477			
	F2																				1849902						1849902			
	G2																					5					5			
	G3	20	4	4																			336			27	391			
	H1																							418771			418771			
H2																					231		6800122			6800353				
H3																								134328		134328				
N																					40	527				567				
	Class Total (2015-16)	91047	202822	239596	24432	156701	9224	23891	14158	42966	175009	1011	2117	1339	1147	40	17972	27627	37477	1849902	276	863	418771	6800122	134328	102				
	Total LD area in 2015-16	10272838																												

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 102 ha (0.001%)		Green Denotes Land degradation to Normal land	
*Normal land to Land degradation: (+) 567 ha (0.006 %)		Red Denotes change from Normal land to Land degradation	
*Net increase (+) 465 ha (0.005 %)		Black Denotes no change in Land degradation class	
# Percentage is w.r.t LD of Jammu and Kashmir State during 2005-06		Blue Denotes inter-class change	
A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 28: Category - wise distribution of land degradation in different districts of Jammu & Kashmir State

Area in hectares

LD Class	DISTRICTS																							
	ANANTNAG		BADGAM		BANDIPORE		BARAMULA		BEYOND LOC		DODA		GANDERBAL		JAMMU		KARGIL		KATHUA		KISHTWAR		KULGAM	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	4535	4535	1679	1699	1053	1053	4348	4348	48443	48443	2692	2692	498	498	2680	2680	470	470	3901	3901			1392	1392
A2			498	502	122	122	3	3	89421	89421	35419	35419	100	100	386	386	521	521	7418	7418	6306	6306		
A3	33	33	111	115					229038	229038	2063	2063			12	12	75		967	967	987	987		
A4									277	277							13911	13911						
A5	215	215	21	21	372	372	129	129	33565	33565	106	106			158	158	20389	20389	875	875	3814	3814	1486	1486
A6							3	3	117	117													86	86
A7			2178	2178	806	806			224	224	613	613					967	967	3341	3341				
B1									5903	5903														
B2									430	430							4176	4176						
B3									661	661							3591	3591						
B4																								
B5																								
B6																								
C1															284	284			755	755				
C3					40	40																		
D7									10031	10031														
D8									222	222							711	711						
F1									1097	1097							10878	10878			12527	12527		
F2	578	578	16	16	2581	2581	1311	1311	1575014	1575014	1410	1410	592	592			120368	120368			17833	17833	376	376
G2														57										
G3			379	821																				
H1	230	230			927	927			246084	246084	3206	3206	1988	1988	89	89	46492	46492	71	71	9282	9282	1987	1987
H2	48359	48359	2014	2014	89892	89892	21387	21387	4841471	4841471	43915	43915	17116	17059	7969	7969	402148	402148	29748	29748	278685	278685	13672	13672
H3	852	852			488	488			69158	69158	116	116					11539	11539	367	367	15069	15069		
Total	54802	54802	6896	7366	96281	96281	27181	27181	7151156	7151156	89540	89540	20294	20294	11578	11578	636236	636161	47443	47443	344503	344503	18999	18999

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Jammu & Kashmir State

Area in hectares

	DISTRICTS																							
LD Class	KUPWARA		LADAKH(LEH)		PULWAMA		PUNCH		RAJOURI		RAMBAN		REASI		SAMBA		SHUPIYAN		SRINAGAR		UDHAMPUR		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	2170	2170			637	637	3543	3543	5072	5072	524	524	973	973	2605	2605	638	638	130	130	3044	3044	91027	91047
A2	3	3	699	699	54	54	24170	24170	8477	8477	6778	6778	3165	3165	279	279					18999	18999	202818	202822
A3	165	165			503	503	4824	4824	31	31	304	304	346	346	208	208							239667	239596
A4			10244	10244																			24432	24432
A5	16	16	94683	94683					88	88	201	201	287	287	49	49					247	247	156701	156701
A6			7792	7792													1226	1226					9224	9224
A7			12245	12245																	3517	3517	23891	23891
B1			8255	8255																			14158	14158
B2			38360	38360																			42966	42966
B3			170757	170757																			175009	175009
B4			1011	1011																			1011	1011
B5			2117	2117																			2117	2117
B6			1339	1339																			1339	1339
C1															108	108							1147	1147
C3																							40	40
D7			7941	7941																			17972	17972
D8			26694	26694																			27627	27627
F1			12975	12975																			37477	37477
F2	448	448	122507	122507			3211	3211	2416	2416			1241	1241									1849902	1849902
G2		12				71													5	136			5	276
G3					12	42																	391	863
H1	36	36	107830	107830			90	90	55	55			111	111							293	293	418771	418771
H2	25766	25754	791432	791432	9116	9054	47025	47025	17144	17144	45486	45486	22060	22060	5496	5496	1821	1821	7679	7579	30952	30952	6800353	6800122
H3	304	304	36222	36222							213	213											134328	134328
Total	28908	28908	1453103	1453103	10322	10361	82863	82863	33283	33283	53506	53506	28183	28183	8745	8745	3685	3685	7814	7845	57052	57052	10272373	10272838

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Beyond LOC (7151156ha)

Maximum changes in land degradation:-Badgam District (+470 ha, 0.005% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

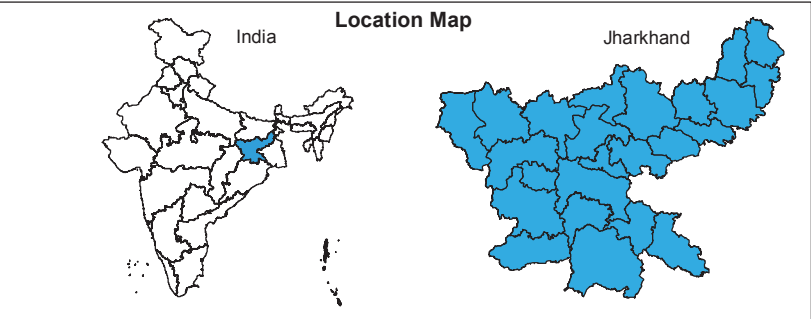
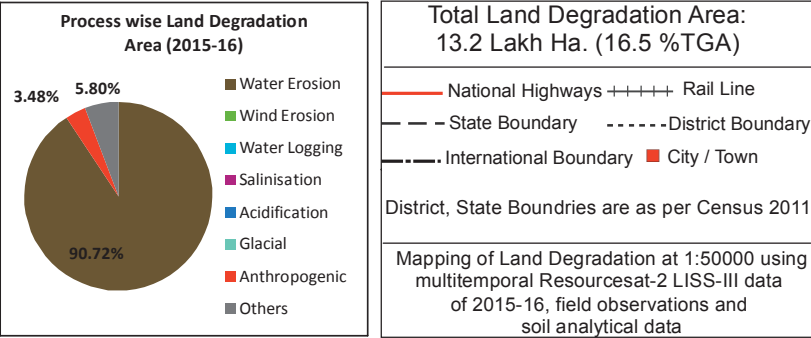
LAND DEGRADATION MAP OF JHARKHAND
2015-16

ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

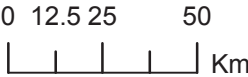
S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		203520
2		A2	Sheet erosion - Moderate		626735
3		A3	Sheet erosion - Severe		265911
4		A4	Rills		
5		A5	Gullies		94141
6		A6	Ravines-Shallow		6613
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		66
15		C3	Subsurface waterlogged		288
16	Salinisation / Alkalisatation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		533
24		G2	Mining and dump areas		41122
25		G3	Brick kiln		4324
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		71290
28		H3	RiverineSands/Sea Ingress etc		5233

Note: White colour in map indicates either no apparent degradation or normal land.



Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination Indian Institute of Remote Sensing, Kalidas road, Deharadun-240001	Partner Institution(s) Jharkhand Space Application Centre Gol chakkar, Dhurwa Ranchi - 843004
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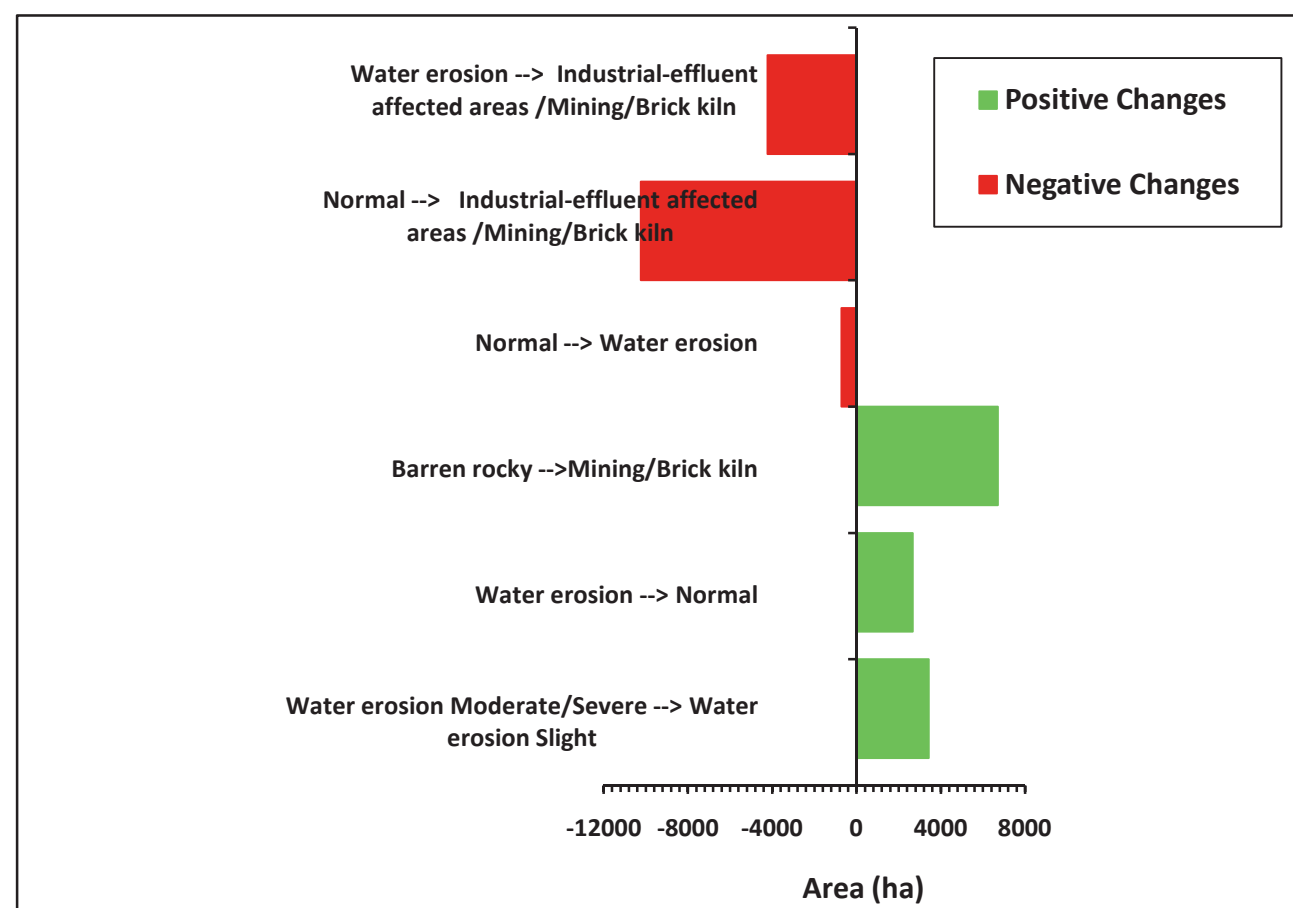
Fig. 13



**Table 29: Change matrix of land degradation classes in Jharkhand State
(during 2005-06 and 2015-16)**

Area in hectares															
		2015-16													
	LD Class	A1	A2	A3	A5	A6	C1	C3	G1	G2	G3	H2	H3	N	Class Total (2005-06)
2005-06	A1	199646	42						59	129	70			139	200085
	A2	3183	626596	53					78	1720	581			1662	633873
	A3	248		265677					55	558	167			616	267321
	A5				94141					676	138			250	95205
	A6					6613									6613
	C1						66								66
	C3							288							288
	G1								231					14	245
	G2									22711					22711
	G3										1869				1869
	H2									6706		71290		189	78185
	H3												5233		5233
	N	443	97	181					110	8622	1499				10952
	Class Total (2015-16)	203520	626735	265911	94141	6613	66	288	533	41122	4324	71290	5233	2870	
	Total LD area in 2015-16	1319776													

Significant land degradation changes between 2005-06 and 2015-16



•Land degradation to Normal land : (-) 2870 ha (0.22 %)
 •Normal land to Land degradation: (+) 10952 ha (0.83 %)
 •Net increase (+) 8082 ha (0.61 %)
 # Percentage is w.r.t LD of Jharkhand State during 2005-06

Green Denotes Land degradation to Normal land
Red Denotes change from Normal land to Land degradation
Black Denotes no change in Land degradation class
Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 30: Category - wise distribution of land degradation in different districts of Jharkhand State

Area in hectares

	DISTRICTS																							
LD Class	BOKARO		CHATRA		DEVGHAR		DHANBAD		DUMKA		GARHWA		GIRIDIH		GODDA		GUMLA		HAZARIBAG		JAMTARA		KHUNTI	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	2015	1975	1964	2049	1632	1632	881	881	1647	1605	18021	18444	2990	6280	194	194	2298	2298	750	750	428	433	5890	5888
A2	30752	30580	18551	18401	44236	44119	19799	19570	23992	23774	31330	31325	112814	109279	12410	12410	52227	51515	44923	44707	18263	17842	6878	6833
A3	15413	15410	9181	9227	5551	5531	5550	5410	2663	2645	12644	12644	14821	14550	1449	1455	21335	21321	19729	19642	839	839	2539	2539
A5	747	740	25465	24783	11346	11346	248	225	1000	1000	4331	4331	14219	14212	805	805	10760	10686	7529	7517	678	672	368	368
A6			6518	6518																				
C1																								
C3																								
G1	203	299		22				61																
G2	2038	3687	1410	2495	185	264	3868	7006	787	1155	207	211	330	493	827	827	295	6620	804	1201	14	60	580	598
G3	107	217		46	52	61	418	715	8	16	21	25	7	31				154	145	337		2	35	47
H2	3244	3204	972	972	1785	1752	2387	2353	901	901	1756	1756	2594	2581	3138	3138	18860	13973	340	340	373	373	2847	2817
H3	204	204			337	337	236	236	149	149			255	255			9	9	601	601	189	189	289	289
Total	54723	56316	64061	64513	65124	65042	33387	36457	31147	31245	68310	68736	148030	147681	18823	18829	105784	106576	74821	75095	20784	20410	19426	19379

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Jharkhand State

Area in hectares

	DISTRICTS																											
LD Class	KODARMA		LATEHAR		LOHARDAGA		PAKUR		PALAMU		PASHCHIMI SINGHBHUM		PURBI SINGHBHUM		RAMGARH		RANCHI		SAHIBGANJ		SARAIKELA		SIMDEGA		Total			
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16		
A1	5270	5233	21392	21340	762	762	6199	6196	26854	26812	55697	55682	10889	10890	1385	1332	17293	17301	5297	5297	3158	3105	7179	7141	200085	203520		
A2	28489	28159	23850	23667	3572	3547	1742	1740	24513	24434	38107	38100	20942	20884	27310	26889	29281	29204	6131	6131	5361	5336	8400	8289	633873	626735		
A3	13297	13295	44566	44646	7952	7911	1925	1925	6386	6073	8990	8897	13696	13496	2257	2248	851	724	2025	2102	11700	11454	41962	41927	267321	265911		
A5	5534	5498	8985	8975	900	895	26	26	1226	1195	105	88	7		236	234	105	95	82	82	116		387	368	95205	94141		
A6			95	95																						6613	6613	
C1																			66	66							66	66
C3							158	158											130	130							288	288
G1		40					20	20				1	22	22		68											245	533
G2	383	607	332	675	490	828	2046	2054	235	518	1176	1655	336	577	2372	3261	1387	1535	2104	2123	478	804	27	1868	22711	41122		
G3	10	38	2	107	34	130			10	320	30	97	252	522	139	528	320	548	51	51	228	265		67	1869	4324		
H2	305	301	370	340	893	748	1061	1061	12371	12371	2205	2202	1215	1144	956	945	10444	10319	759	757	4007	3858	4402	3084	78185	71290		
H3	720	720									24	24	733	733	76	76	940	940			471	471			5233	5233		
Total	54008	53891	99592	99845	14603	14821	13177	13180	71595	71723	106334	106746	48092	48268	34731	35581	60621	60666	16645	16739	25519	25293	62357	62744	1311694	1319776		

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Giridih District (147681 ha, 36% of district TGA)

Maximum changes in land degradation:-Dhanbad District (+3070 ha, 0.23% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF KARNATAKA
2015-16

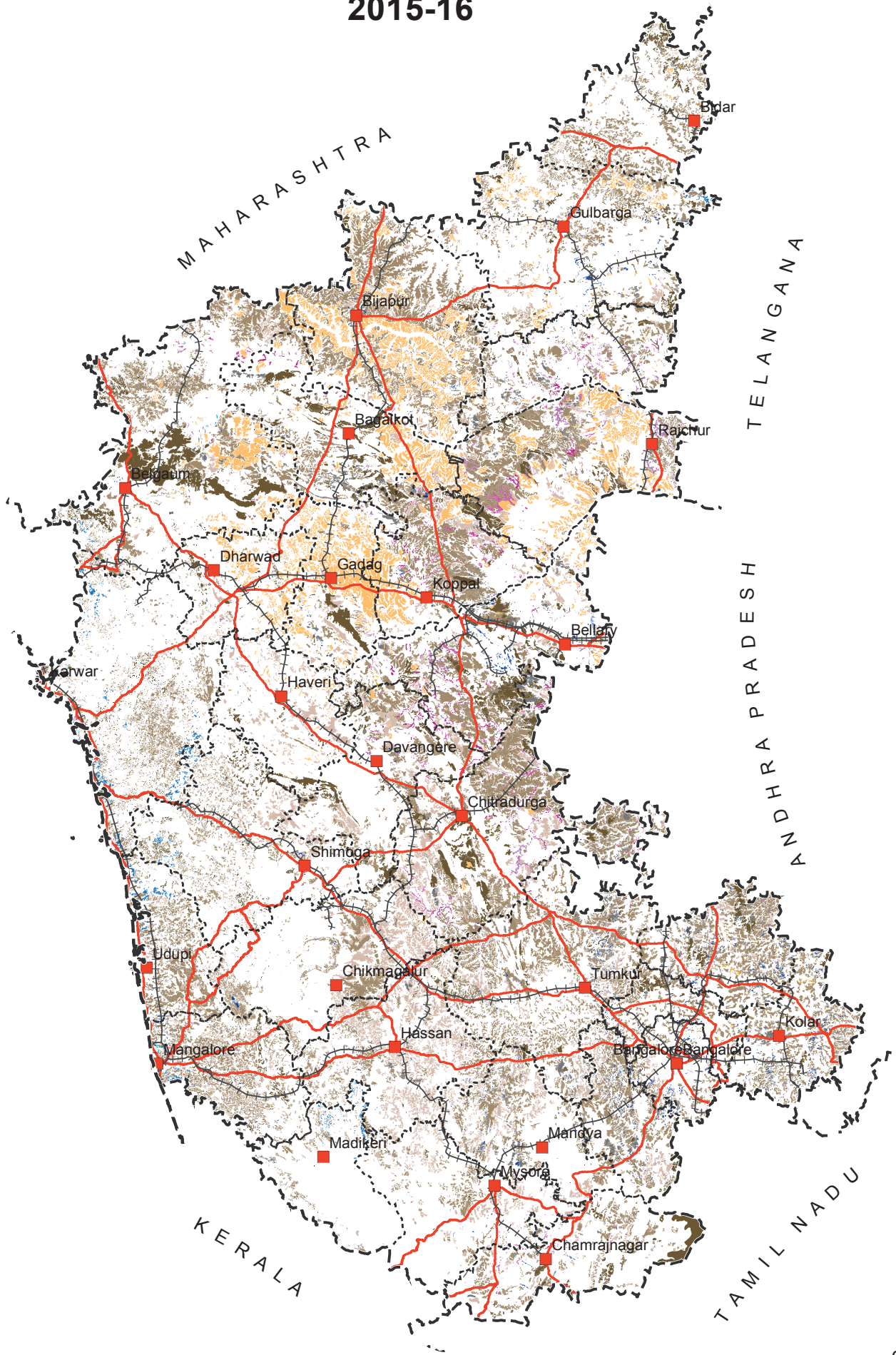
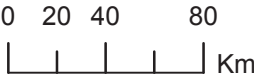


Fig. 14

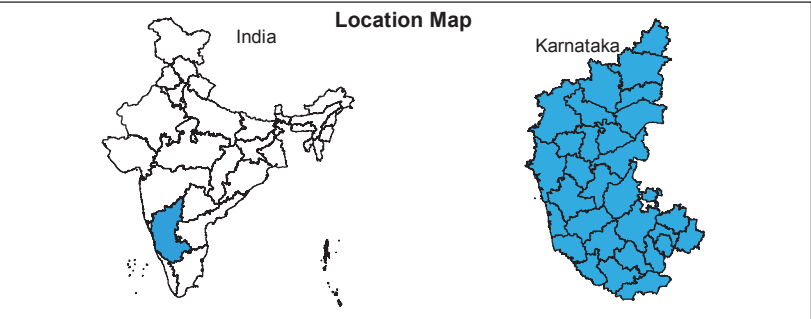
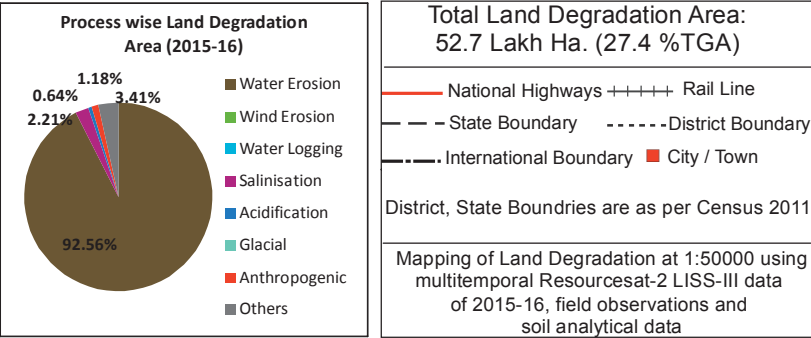


ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		774287
2		A2	Sheet erosion - Moderate		2798797
3		A3	Sheet erosion - Severe		636983
4		A4	Rills		652724
5		A5	Gullies		13229
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		1968
15		C3	Subsurface waterlogged		36
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		43102
17		D4-D6	Sodic - Slight/Moderate/Severe		28143
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		45265
19		D10	Rann		
20	Acidification	E1/E2	Acidic - Moderate/Severe		33797
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		2314
24		G2	Mining and dump areas		59521
25		G3	Brick kiln		382
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		175526
28		H3	RiverineSands/Sea Ingress etc		4131

Note: White colour in map indicates either no apparent degradation or normal land.

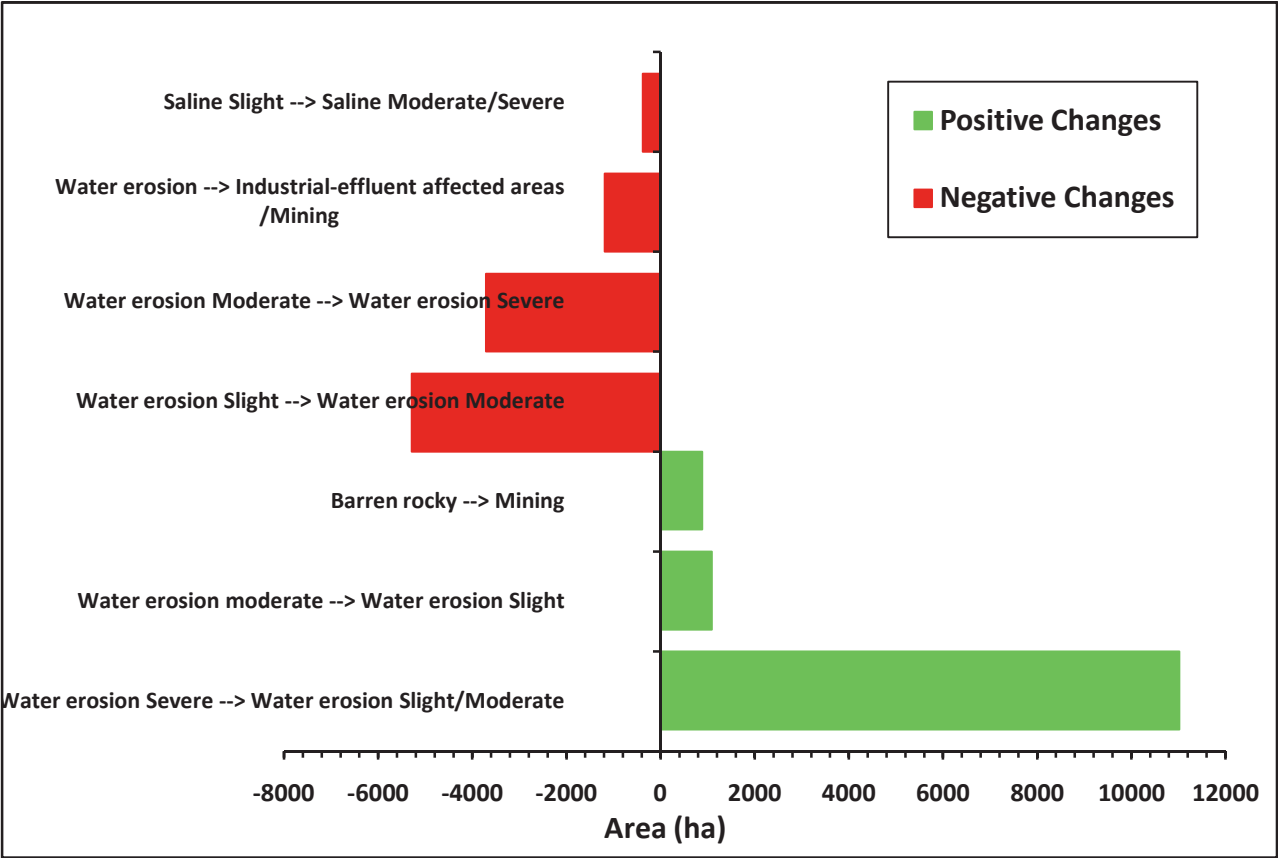


Project Execution	Regional Coordination	Partner Institution(s)
Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Remote Sensing Centre – South, ISITE Campus Bangalore-560037	KRSRAC, Dept. of IT & Biotech., Govt. of Karnataka, Dodddaettahalli, Bengaluru-560097

Table 31: Change matrix of land degradation classes in Karnataka State
(during 2005-06 and 2015-16)

		(during 2005-06 and 2015-16)																										Area in hectares		
		2015-16																												
	LD Class	A1	A2	A3	A4	A5	C1	C2	C3	D1	D2	D3	D4	D5	D6	D7	D8	D9	E1	E2	G1	G2	G3	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06		
2005-06	A1	763302	5285																			26					768613	5270324		
	A2	1090	2792387	3713																		1037				119	2798346			
	A3	9895	1125	633270																	27	98					644415			
	A4				652724																						652724			
	A5					13229																					13229			
	C1						581																				581			
	C2							1387																			1387			
	C3								36																		36			
	D1									31555	251	126															31932			
	D2										4935																4935			
	D3											6235															6235			
	D4												17902														17902			
	D5													9557													9557			
	D6														684												684			
	D7															21219					6						21225			
	D8																12729										12729			
	D9																	11317									11317			
	E1																		33583								33583			
	E2																			214							214			
	G1																					2281					2281			
G2																						57473				57473				
G3																							382			382				
H2																						887		175526		176413				
H3																								4131		4131				
	Class Total (2015-16)	774287	2798797	636983	652724	13229	581	1387	36	31555	5186	6361	17902	9557	684	21219	12729	11317	33583	214	2314	59521	382	175526	4131	119				
	Total LD area in 2015-16	5270205																												

Significant land degradation changes between 2005-06 and 2015-16



•Land degradation to Normal land : (-) 119 ha (0.002 %)
 Green Denotes Land degradation to Normal land

•Normal land to Land degradation: (+) 0 ha (0 %)
 Red Denotes change from Normal land to Land degradation

•Net decrease : (-) 119 ha (0.002 %)
 Black Denotes no change in Land degradation class

Percentage is w.r.t LD of Karnataka State during 2005-06
 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 32: Category - wise distribution of land degradation in different districts of Karnataka State

Area in hectares

LD Class	DISTRICTS																							
	BAGALKOT		BANGALORE RURAL		BANGALORE URBAN		BELGAUM		BELLARY		BIDAR		BIJAPUR / VIJAYAPURA		CHAMRAJNAGAR		CHIKKABALLAPUR		CHIKMAGALUR		CHITRADURGA		DAKSHIN KANNAD	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	6911	6911	2457	2457	4136	4136	18485	13714	29782	29782	8467	9039	14615	15032	14006	14098	12166	12166	75544	75544	66390	75127	12624	12624
A2	56921	57160	43794	43794	26398	26398	185056	190063	111141	111355	98052	94658	260226	259621	52101	52009	125997	125878	80993	80993	192935	192935	109582	109582
A3	52150	51911	7212	7212	1459	1459	126695	126459	65560	65328	18203	20961	17336	17524	40118	40118	18738	18738	1930	1930	70469	61732	10575	10575
A4	62362	62362	19	19			62864	62864	21675	21675	2733	2733	142518	142518	91	91	179	179	99	99	3510	3510	35	35
A5	90	90	969	969	224	224	188	188	915	915			1092	1092	139	139	2033	2033	229	229	898	898	134	134
C1							140	140																
C2							151	151															339	339
C3																								
D1	559	559	60	60			293	293	3057	3057			90	90	638	638	156	156			3799	3799		
D2	274	274	6	6			493	493	604	604			108	108	82	82	199	199	163	163	352	352		
D3	135	135					382	382	1720	1720									44	44	2795	2795		
D4	353	353					810	810	2000	2000			109	109	340	340			70	70	2671	2671		
D5	292	292					1632	1632	916	916			56	56	28	28			6	6	3049	3049		
D6							13	13											41	41	322	322		
D7	375	375							3564	3564			16	16	759	759	117	117	7	7	3410	3410		
D8							138	138	2864	2864			19	19	148	148	28	28			577	577		
D9	1104	1104					491	491	4342	4342					286	286	20	20	32	32	3160	3160		
E1							1017	1017									29	29	36	36			2734	2734
E2																								
G1			219	219	1847	1847															40	40		
G2	1174	1174	1889	1897	2932	2935	1127	1127	6031	6249	94	182	1344	1394	852	879	8398	8398	1516	1516	1488	1498	174	174
G3																							203	203
H2	12588	12588	2513	2505	561	558	5756	5756	14783	14583	169	145	2061	2011	2416	2389	10783	10783	711	711	13541	13531	1893	1893
H3									2250	2250					66	66			132	132			313	313
Total	195288	195288	59138	59138	37557	37557	405731	405731	271204	271204	127718	127718	439590	439590	112070	112070	178843	178724	161553	161553	369406	369406	138606	138606

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Karnataka State

Area in hectares

LD Class	DISTRICTS																			
	DAVANGERE		DHARWAD		GADAG		GULBARGA		HASSAN		HAVERI		KODAGU		KOLAR		KOPPAL		MANDYA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	42528	42857	8293	8214	13003	13003	22652	22902	121999	121999	39268	39425	1975	1975	6266	6266	26486	26557	45327	45327
A2	81793	81800	6224	6303	17080	17080	107428	106433	63582	63582	7659	7733	14275	14275	95846	95846	126218	126135	70769	70769
A3	28474	28138	7860	7838	20513	20513	27702	27599	1327	1327	11863	11632	196	196	6017	6017	20089	19976	3064	3064
A4	2519	2519	40457	40457	101841	101841	29373	29373			5432	5432			225	225	60633	60633		
A5	544	544	18	18	288	288	1131	1131	17	17	314	314			1445	1445	19	19	32	32
C1							34	34												
C2																				
C3																				
D1	25	25	223	223	639	639	408	408							39	39	166	166	133	133
D2	10	10			190	190	21	21			44	44			69	69	13	13		
D3	242	242					8	8									278	278		
D4	1344	1344			305	305	18	18	10	10							778	778		
D5	91	91							38	38							729	729		
D6	14	14							21	21							144	144		
D7	4115	4115													8	8	3236	3236		
D8	435	435			50	50	129	129			13	13					5090	5090		
D9	409	409															129	129		
E1							2751	2751	67	67	175	175	3319	3319	16	16				
E2									38	38			96	96						
G1	64	64					14	14									10	10		
G2	861	861	424	446	415	415	4696	5628	1099	1099	468	468	41	41	6561	6561	483	1031	3500	3500
G3	6	6	87	87																
H2	2456	2456	61	61	4652	4652	3815	3731	4415	4415	247	247	1763	1763	6537	6537	9865	9442	6638	6638
H3	3	3			3	3	7	7	92	92	6	6								
Total	165933	165933	63647	63647	158979	158979	200187	200187	192705	192705	65489	65489	21665	21665	123029	123029	254366	254366	129463	129463

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Karnataka State

Area in hectares

LD Class	DISTRICTS																	
	MYSORE		RAICHUR		RAMANAGARA		SHIMOGA		TUMKUR		UDUPI		UTTAR KANNAD		YADGIR		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	34749	34750	22216	22136	17181	17181	30583	30583	49467	49445	8164	8164	9248	9248	3625	3625	768613	774287
A2	33108	33107	146634	146816	81912	81893	64458	64458	273416	273438	92327	92327	95639	95639	76782	76717	2798346	2798797
A3	1047	1047	26639	26537	6513	6513	22975	22975	15163	15163	2401	2401	6665	6665	5462	5435	644415	636983
A4	14	14	111323	111323	20	20			115	115					4687	4687	652724	652724
A5	329	329	24	24	382	382	13	13	775	775			12	12	975	975	13229	13229
C1									10	10	7	7	390	390			581	581
C2											694	694	203	203			1387	1387
C3													36	36			36	36
D1	322	322	14927	14927	40	40			514	514			406	406	5438	5061	31932	31555
D2	74	74	930	930					319	319			80	80	904	1155	4935	5186
D3			119	119											512	638	6235	6361
D4	77	77	7261	7261					292	292					1464	1464	17902	17902
D5			2411	2411					134	134					175	175	9557	9557
D6			27	27											102	102	684	684
D7	156	156	2452	2452					2043	2043					967	961	21225	21219
D8	44	44	1591	1591					386	386					1217	1217	12729	12729
D9			156	156					104	104					1084	1084	11317	11317
E1							3943	3943	195	195	6031	6031	13270	13270			33583	33583
E2													80	80			214	214
G1					41	41			13	13			33	33		33	2281	2314
G2	339	339	724	724	3958	3981	563	563	5441	5441	210	210	87	87	584	703	57473	59521
G3							18	18			20	20	48	48			382	382
H2	793	793	13077	13077	14533	14529	672	672	22670	22670	2659	2659	5512	5512	8273	8219	176413	175526
H3	359	359	183	183			166	166	259	259	115	115	177	177			4131	4131
Total	71411	71411	350694	350694	124580	124580	123391	123391	371316	371316	112628	112628	131886	131886	112251	112251	5270324	5270205

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Vijayapura District (439590 ha, 42% of district TGA)

Maximum changes in land degradation:-Chikkaballapur District (-119 ha, 0.002% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF KERALA
2015-16

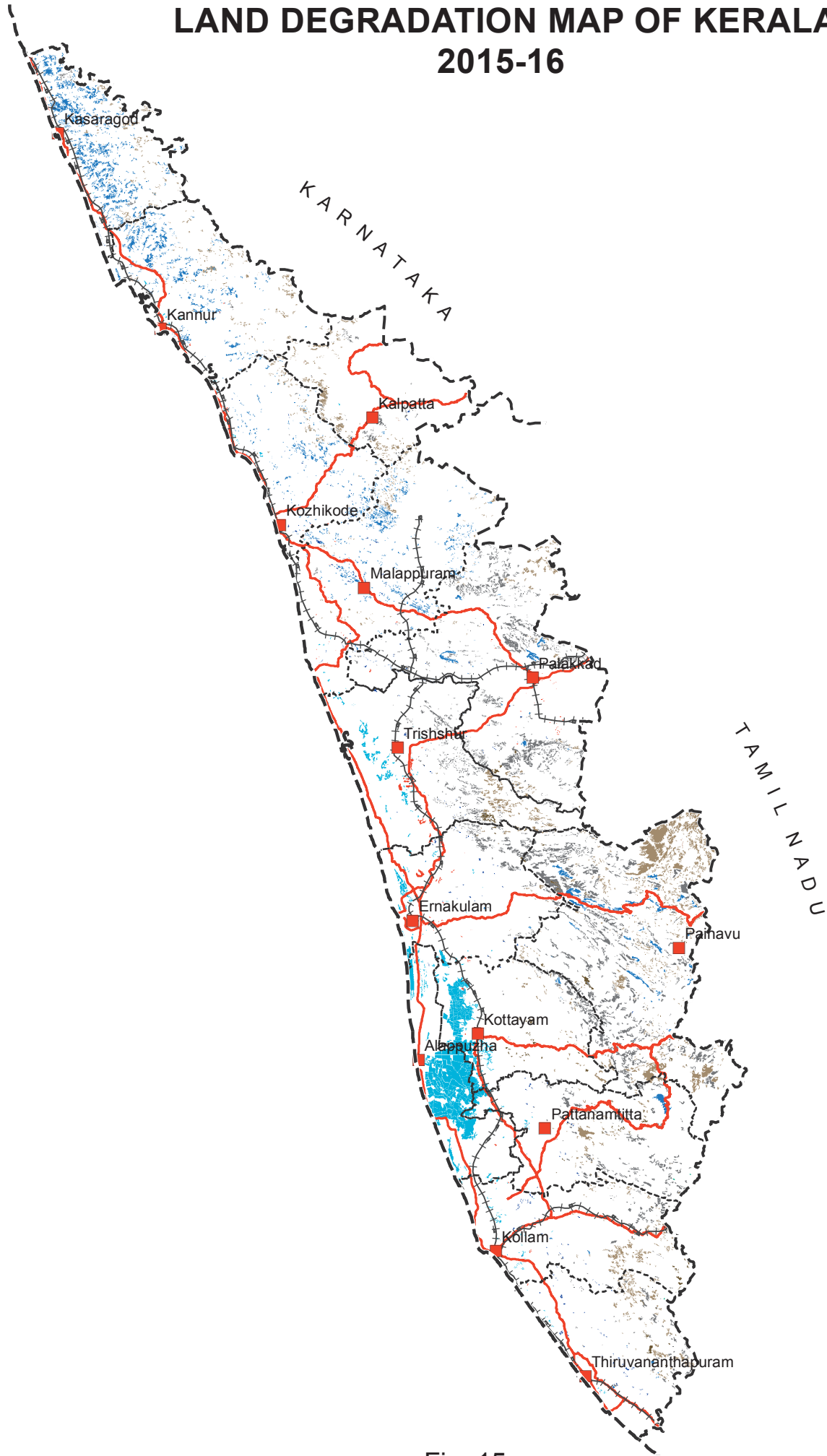
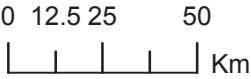


Fig. 15

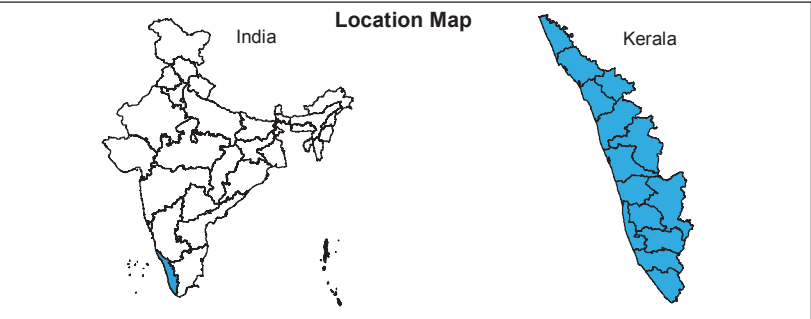
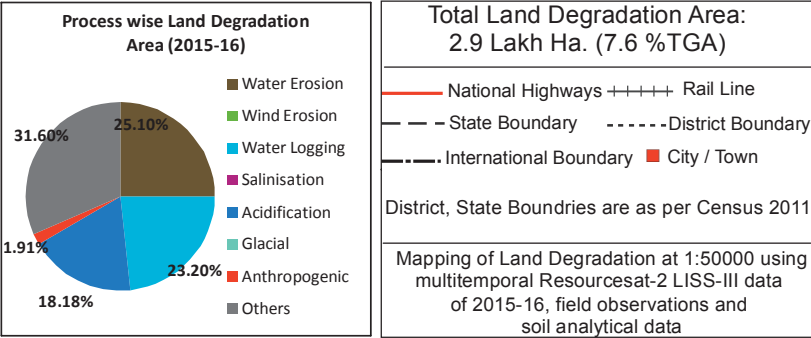


ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		463
2		A2	Sheet erosion - Moderate		68914
3		A3	Sheet erosion - Severe		5318
4		A4	Rills		
5		A5	Gullies		
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		69037
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		54092
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		
24		G2	Mining and dump areas		3059
25		G3	Brick kiln		2632
26	Others	H1	Mass movement / mass wastage		62
27		H2	Barren rocky / Stony waste		91816
28		H3	RiverineSands/Sea Ingress etc		2143

Note: White colour in map indicates either no apparent degradation or normal land.



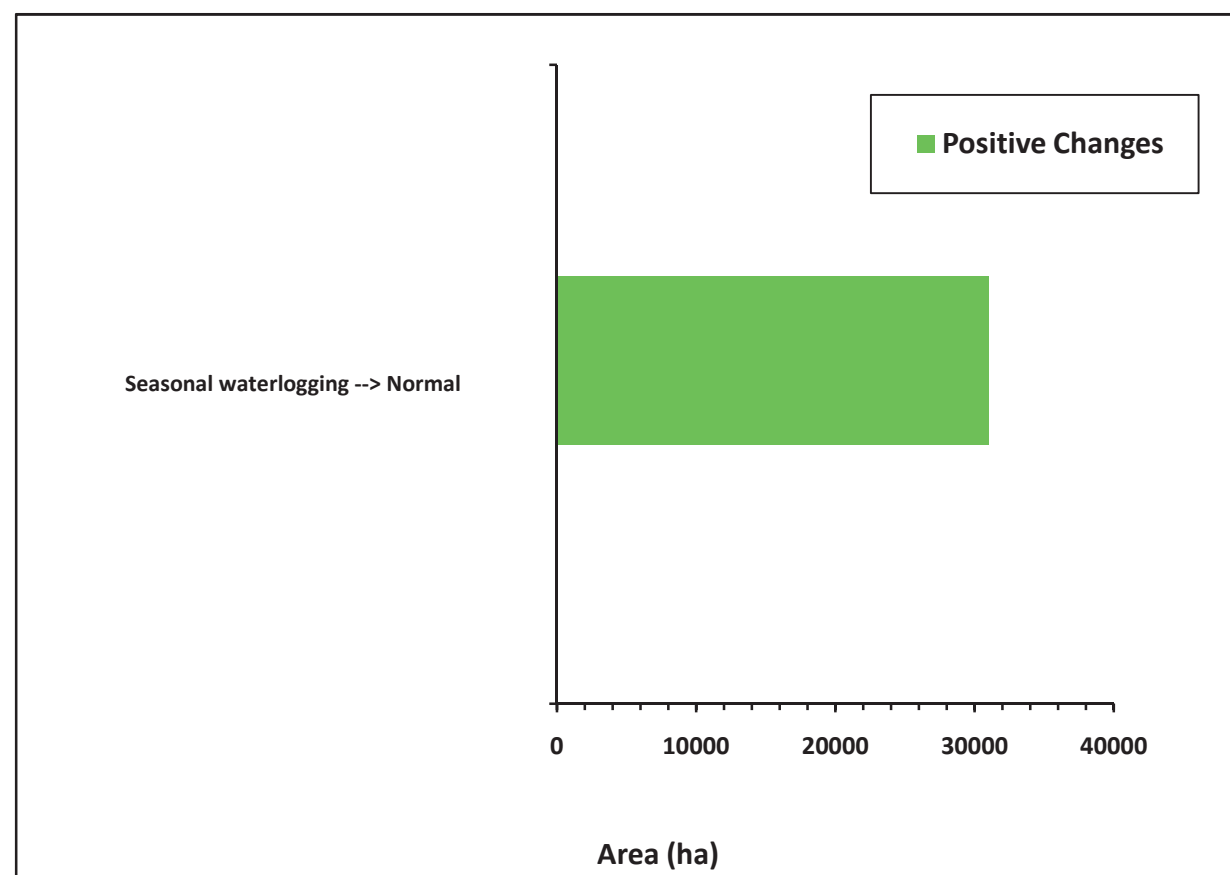
Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination Regional Remote Sensing Centre – South, ISITE Campus Bangalore-560037	Partner Institution(s) Kerala State RS & Environment Centre, Vikas Bhavan, Thiruvananthapuram-695033
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**Table 33: Change matrix of land degradation classes in Kerala State
(during 2005-06 and 2015-16)**

(during 2005-06 and 2015-16)

Area in hectares																
		2015-16														
	LD Class	A1	A2	A3	C1	C2	E1	E2	G2	G3	H1	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06
2005-06	A1	463							30					22	515	328842
	A2		68914						54					89	69057	
	A3			5318										152	5470	
	C1				52929	34								31010	83973	
	C2					16074								33	16107	
	E1						46275		33						46308	
	E2							7817							7817	
	G2								2810						2810	
	G3									2632					2632	
	H1										62				62	
	H2								132			91816			91948	
	H3												2143		2143	
	Class Total (2015-16)	463	68914	5318	52929	16108	46275	7817	3059	2632	62	91816	2143	31306		
	Total LD area in 2015-16	297536														

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 31306 ha (9.52 %)

*Normal land to Land degradation: (+) 0 ha (0 %)

*Net decrease (-) 31306 ha (9.52 %)

Percentage is w.r.t LD of Kerala State during 2005-06

Green Denotes Land degradation to Normal land

Red Denotes change from Normal land to Land degradation

Black Denotes no change in Land degradation class

Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 34: Category - wise distribution of land degradation in different districts of Kerala State

Area in hectares

LD Class	DISTRICTS															
	ALAPPUZHA		ERNAKULAM		IDUKKI		KANNUR		KASARAGOD		KOLLAM		KOTTAYAM		KOZHIKODE	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1			6		138	138	162	162	2	2					11	11
A2	9	9	473	473	32470	32464	3306	3253	2560	2560	4223	4223	1431	1425	1468	1468
A3			231	231	1182	1182	12	12	10	10	613	613	781	781	20	20
C1	40359	34953	1083		305		2043	49	571		2026		14040	12522	1840	
C2	3754	3754	3595	3591			190	212	16	16	658	666	6012	6012	252	252
E1			92	92	1894	1894	10490	10490	19142	19142	59	59	11	11	4225	4192
E2					5708	5708			14	14	35	35	191	191		
G2			364	368	63	69	20	55	7	7	350	353	26	26	223	256
G3	28	28	681	681			56	56			56	56	170	170	181	181
H1																
H2			5354	5350	37999	37999	130	130	609	609	2544	2541	4150	4150	256	256
H3	287	287					41	41	125	125	11	11			23	23
Total	44437	39031	11879	10786	79759	79454	16450	14460	23056	22485	10575	8557	26812	25288	8499	6659

LD Class	MALAPPURAM		PALAKKAD		PATTANAMTITTA		THIRUVANANTHAPURAM		TRISHSHUR		WAYANAD		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	71	49	46	46			24				55	55	515	463
A2	2481	2474	4348	4348	3002	2996	4002	4002	4189	4189	5095	5030	69057	68914
A3	6	6	394	394	592	557	766	649	824	824	39	39	5470	5318
C1	8889	88	4951	1	2602	2443	315		4673	2873	276		83973	52929
C2	96	96			267	267	172	172	1072	1047	23	23	16107	16108
E1	7890	7890	2454	2454			6	6			45	45	46308	46275
E2	8	8	89	89	1526	1526	188	188			58	58	7817	7817
G2	387	400	268	314	215	242	645	694	188	213	54	62	2810	3059
G3	100	100	187	187			24	24	1149	1149			2632	2632
H1					40	40	22	22					62	62
H2	276	276	21671	21625	7542	7521	3246	3221	6268	6243	1903	1895	91948	91816
H3	388	388	288	288	2	2	405	405	573	573			2143	2143
Total	20592	11775	34696	29746	15788	15594	9815	9383	18936	17111	7548	7207	328842	297536

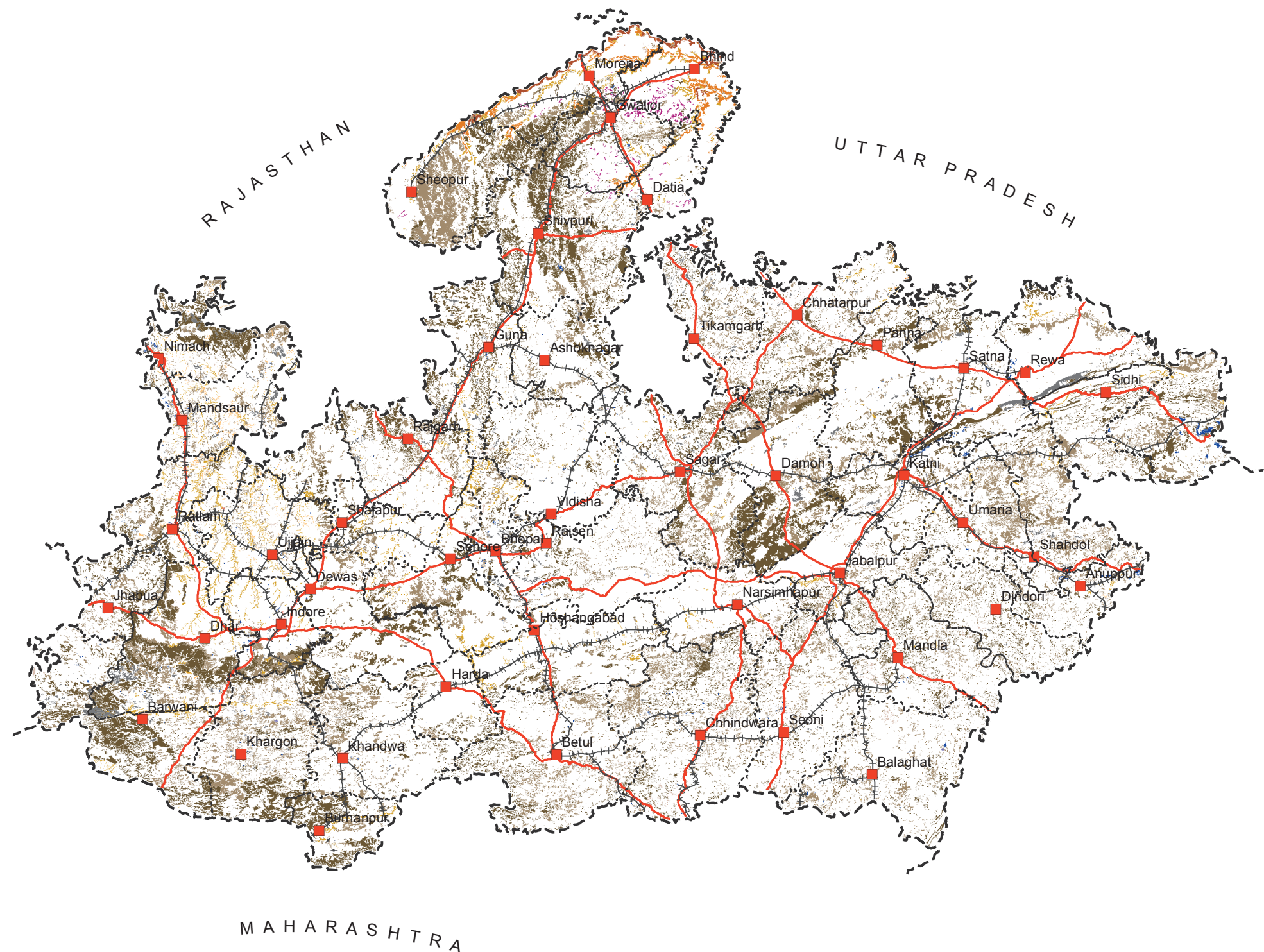
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Idukki District (79454 ha, 18% of district TGA)

Maximum changes in land degradation:-Malappuram District (-8817 ha, 3% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF MADHYA PRADESH
2015-16



ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		33470
2		A2	Sheet erosion - Moderate		2376440
3		A3	Sheet erosion - Severe		2724630
4		A4	Rills		31533
5		A5	Gullies		321053
6		A6	Ravines-Shallow		93069
7		A7	Ravines-Deep		50314
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		92
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisiation	D1-D3	Saline - Slight/Moderate/Severe		162
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic - Moderate/Severe		
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		653
24		G2	Mining and dump areas		
25		G3	Brick kiln		
26	Others	H1	Mass movement / mass wastage		210051
27		H2	Barren rocky / Stony waste		
28		H3	RiverineSands/Sea Ingress etc		

Note: White colour in map indicates either no apparent degradation or normal land.

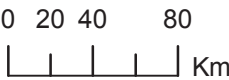
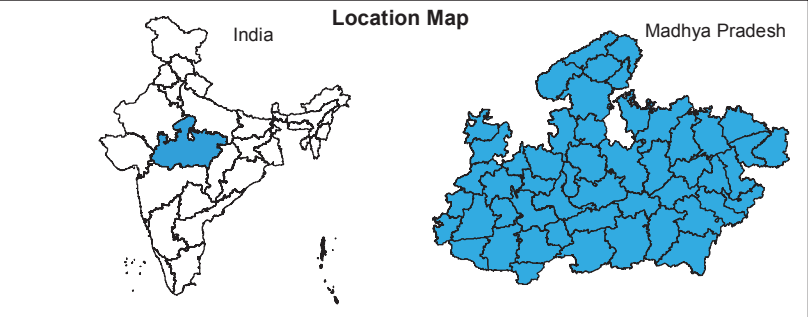
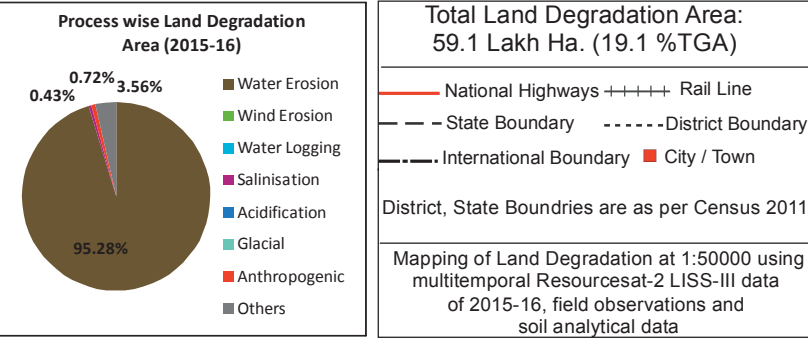
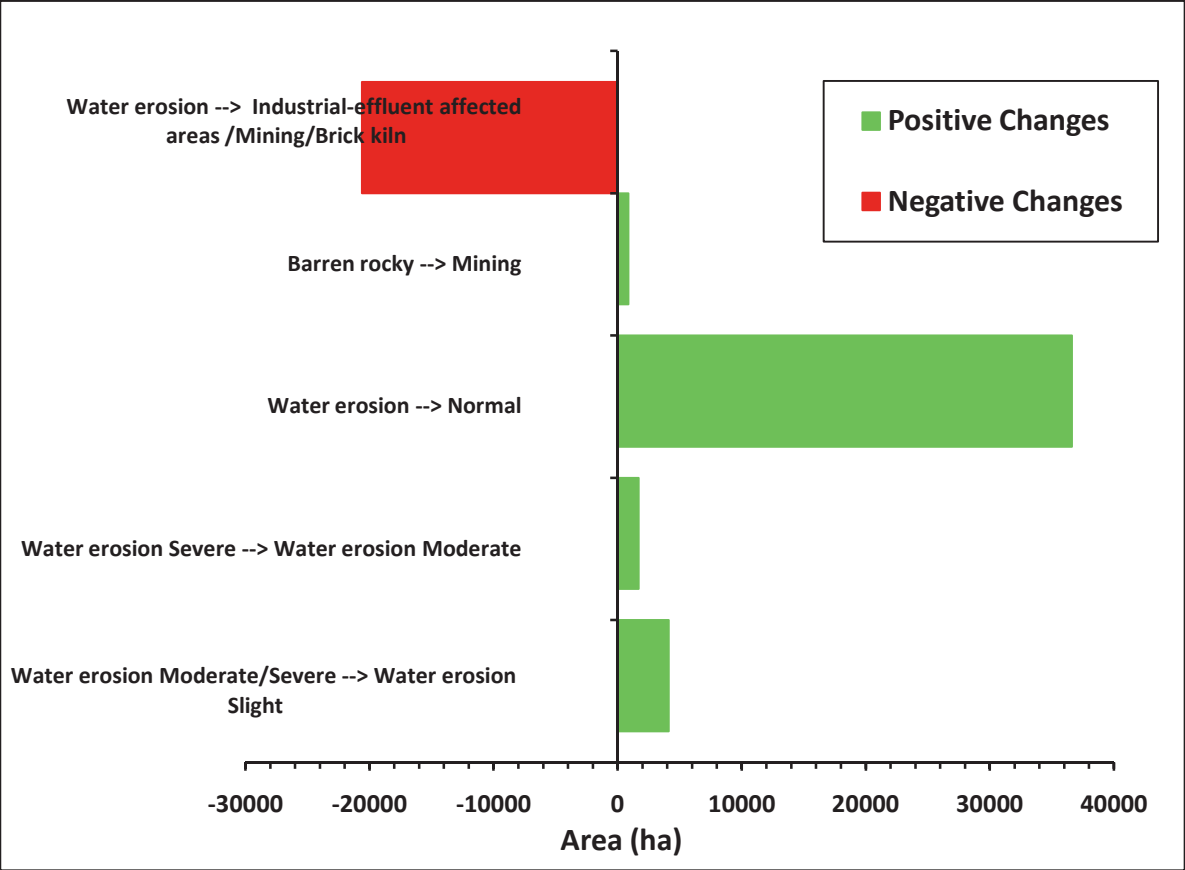


Table 35: Change matrix of land degradation classes in Madhya Pradesh State
(during 2005-06 and 2015-16)

Area in hectares

		2015-16																				
	LD Class	A1	A2	A3	A4	A5	A6	A7	C1	C2	D1	D7	D8	D9	G1	G2	G3	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06
2005-06	A1	29339														3					29342	5946576
	A2	3172	2374734												276	18058	336			31802	2428378	
	A3	959	1706	2724630												1941				4818	2734054	
	A4				31533																31533	
	A5					321053															321053	
	A6						93069														93069	
	A7							50314													50314	
	C1								6												6	
	C2									86											86	
	D1										162									252	414	
	D7											16127									16127	
	D8												8927								8927	
	D9													385							385	
	G1														377						377	
	G2															20553					20553	
	G3																179				179	
	H2																	210051		262	211188	
	H3																		591		591	
	Class Total (2015-16)	33470	2376440	2724630	31533	321053	93069	50314	6	86	162	16127	8927	385	653	41430	515	210051	591	37134		
	Total LD area in 2015-16	5909442																				

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 37134 ha (0.51%)
*Normal land to Land degradation: (+) 0 ha (0 %)
*Net decrease : (-) 37134 ha (0.62%)
Percentage is w.r.t LD of Madhya Pradesh State during 2005-06

Green Denotes Land degradation to Normal land
Red Denotes change from Normal land to Land degradation
Black Denotes no change in Land degradation class
Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 36: Category - wise distribution of land degradation in different districts of Madhya Pradesh State

Area in hectares

LD Class	DISTRICTS																							
	AGARMALWA		ALIRAJPUR		ANUPPUR		ASHOKNAGAR		BALAGHAT		BARWANI		BETUL		BHIND		BHOPAL		BURHANPUR		CHHATARPUR		CHHINDWARA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	14	58	2343	2343	26	26	87	218	2505	2505	45	45	461	471	1676	1733	903	903	81	81	670	667	1984	1984
A2	20901	20293	20686	20381	29871	29466	27985	27671	59070	58981	30534	30352	79761	79628	5217	5160	17323	16676	18975	18698	75163	74974	96747	96294
A3	18423	18348	40892	40860	12548	12548	32338	32190	24844	24833	123208	122983	63008	62984	3429	3314	18042	17698	84147	84111	64322	64294	76483	76237
A4	441	441			363	363															41	41		
A5	4138	4138			1249	1249	922	922	25	25	6738	6738	65	65	19330	19330	12287	12287	6815	6815	5103	5103	136	136
A6	16	16													43786	43786					1303	1303		
A7															19176	19176								
C1																					6	6		
C2																								
D1																								
D7															7707	7707								
D8															2265	2265								
D9																								
G1									244	244														
G2	94	284		417	3027	3418	33	269	780	880		180	24	171	66	181	580	1049		122	23	210	494	1104
G3												20												
H2	363	363	4868	4762	263	263	4733	4733	97	97	1644	1644	25	25	59	59	4795	4733			4665	4665	607	607
H3					23	23																		
Total	44390	43941	68789	68763	47370	47356	66098	66003	87565	87565	162169	161962	143344	143344	102711	102711	53930	53346	110018	109827	151296	151263	176451	176362

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Madhya Pradesh State Area in hectares

	DISTRICTS																									
LD Class	DAMOH		DATIA		DEWAS		DHAR		DINDORI		EAST NIMAR		GUNA		GWALIOR		HARDA		HOSHANGABAD		INDORE		JABALPUR		JHABUA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1			2330	2354		100	924	1045	527	527		172	480	751	173	310		269			512	512			221	221
A2	82620	82500	6445	6355	32277	32095	93379	90241	23218	23218	79370	71805	17169	17178	35675	35308	13346	11884	31643	31643	29462	28450	35703	35586	30409	30109
A3	165995	165995	7656	7580	55517	54496	176742	176616	39572	39572	31770	30113	96943	96277	59993	59966	21658	21619	28438	28438	40925	40909	16546	16546	43400	43360
A4			44	44	655	655	810	810													39	39			88	88
A5	926	926	6309	6309	2715	2715	22922	22922			389	389	6764	6764	4509	4509	1374	1374	12705	12705	15662	15662	4873	4873	69	69
A6			3916	3916											4682	4682							365	365		
A7																										
C1																										
C2			20	20																						
D1															102	102										
D7			1266	1266											4831	4831										
D8			1141	1141											3404	3404										
D9															314	314										
G1															61	61										
G2		62	27	135	392	484	443	1623			19	262		259	551	797		60			682	1318		117		210
G3							18	18														316				
H2	6909	6909	221	215	3364	3364	27356	27246	486	486	1170	1146	9235	9226	1911	1911	422	422	803	803	380	380	540	540	122	122
H3							61	61	8	8																
Total	256450	256392	29375	29335	94920	93909	322655	320582	63811	63811	112718	103887	130591	130455	116206	116195	36800	35628	73589	73589	87662	87586	58027	58027	74309	74179

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Madhya Pradesh State

Area in hectares

LD Class	DISTRICTS																									
	KATNI		MANDLA		MANDSAUR		MORENA		NARSIMHAPUR		NIMACH		PANNA		RAISEN		RAJGARH		RATLAM		REWA		SAGAR		SATNA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	332	332	3824	3824	1623	1632	1363	1524	23	23	844	877					241	241	717	938	260	260	148	171	21	21
A2	45215	43149	37414	37407	71482	60477	24075	23752	17494	17407	24664	21912	40411	40268	33613	33370	43645	43526	31579	31194	31173	30260	87209	86715	32913	30632
A3	39882	39788	52568	52568	4442	4371	59114	58890	14827	14827	90536	90511	84253	84253	33288	33246	50993	50966	38573	38395	25874	25874	121830	121753	77137	77045
A4					10972	10972	62	62			5214	5214	135	135					5555	5555					206	206
A5	1480	1480	819	819	15683	15683	24778	24778	3186	3186	4505	4505	2168	2168	154	154	5672	5672	22722	22722	4210	4210	2150	2150	723	723
A6			91	91			26384	26384	913	913									138	138					15	15
A7							28568	28568																		
C1																										
C2																										
D1											252												60	60		
D7							1668	1668																		
D8							1712	1712																		
D9																										
G1							23	23																	49	49
G2	1675	3165	155	162	819	1527	275	661		22	838	947		143	487	772	24	146	306	571	247	1330	425	823	1337	2182
G3																										
H2	4650	4613	788	788	15953	15912	124	124	74	74	12961	12955	3300	3300	11625	11447	5114	5114	3415	3373	19816	19615	9680	9669	11506	11333
H3			89	89															373	373					37	37
Total	93234	92527	95748	95748	120974	110574	168146	168146	36517	36452	139814	136921	130267	130267	79167	78989	105689	105665	103378	103259	81580	81549	221502	221341	123944	122243

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Madhya Pradesh State

Area in hectares

	DISTRICTS																											
LD Class	SEHORE		SEONI		SHAHDOL		SHAJAPUR		SHEOPUR		SHIVPURI		SIDHI		SINGRAULI		TIKAMGARH		UJJAIN		UMARIA		VIDISHA		WEST NIMAR		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	260	260	257	257			159	159	308	473	112	1327					1119	1217	1150	1903			607	607	12	129	29342	33470
A2	55455	55205	57711	57513	107497	106158	21451	21266	175085	175014	73091	71430	40680	40437	90103	85122	49234	49280	23990	22322	79393	78557	19748	19481	121104	119640	2428378	2376440
A3	53715	53606	27663	27663	15549	15363	13083	13031	81913	81776	238755	236913	31359	31171	47521	47250	20714	20459	8106	8004	14609	14173	27304	27304	113607	113543	2734054	2724630
A4																			6908	6908							31533	31533
A5	15970	15970	27	27	2461	2461	9716	9716	11268	11268	1217	1217	5168	5168	2510	2510	1450	1450	38057	38057	609	609	2966	2966	5359	5359	321053	321053
A6									10720	10720	740	740															93069	93069
A7									2570	2570																	50314	50314
C1																											6	6
C2															66	66											86	86
D1																											414	162
D7									448	448	207	207															16127	16127
D8											405	405															8927	8927
D9											71	71															385	385
G1																									276	377	653	
G2	7	317	126	324	10	597	93	302		30	900	1064		217	4520	9772	692	803	195	779	16	235	68	333	103	594	20553	41430
G3																			161	161							179	515
H2	1170	1170	1149	1149	4079	4079			190	190	2246	2222	2585	2585	1072	1072	11141	11130	1911	1829	594	594	6313	6313	4694	4680	211188	210051
H3																											591	591
Total	126577	126528	86933	86933	129596	128658	44502	44474	282502	282489	317744	315596	79792	79578	145792	145792	84350	84339	80478	79963	95221	94168	57006	57004	244879	244221	5946576	5909442

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Dhar District (320582ha, 39% of district TGA)

Maximum changes in land degradation:-Mandsaur District (-10400 ha, 0.17% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet – Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

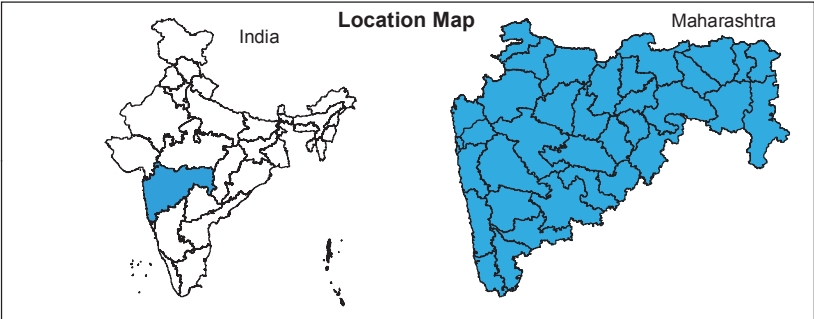
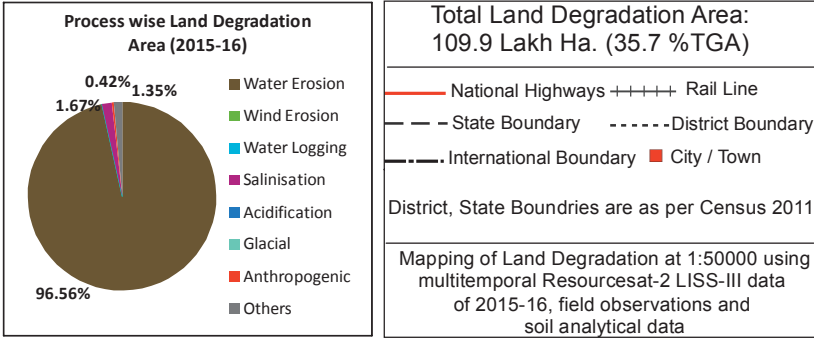
LAND DEGRADATION MAP OF MAHARASHTRA
2015-16

ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		1102255
2		A2	Sheet erosion - Moderate		6164619
3		A3	Sheet erosion - Severe		3185807
4		A4	Rills		33065
5		A5	Gullies		127537
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		46051
17		D4-D6	Sodic - Slight/Moderate/Severe		106302
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		31080
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		1351
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		1139
24		G2	Mining and dump areas		43145
25		G3	Brick kiln		1928
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		147256
28		H3	RiverineSands/Sea Ingress etc		1371

Note: White colour in map indicates either no apparent degradation or normal land.



Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination Regional Remote Sensing Centre – Central,NBSS & LUP Campus, Nagpur-440010	Partner Institution(s) Maharashtra Remote Sensing Appl. Centre, VNIT Campus, South Ambazari Road, Nagpur – 440010
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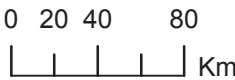
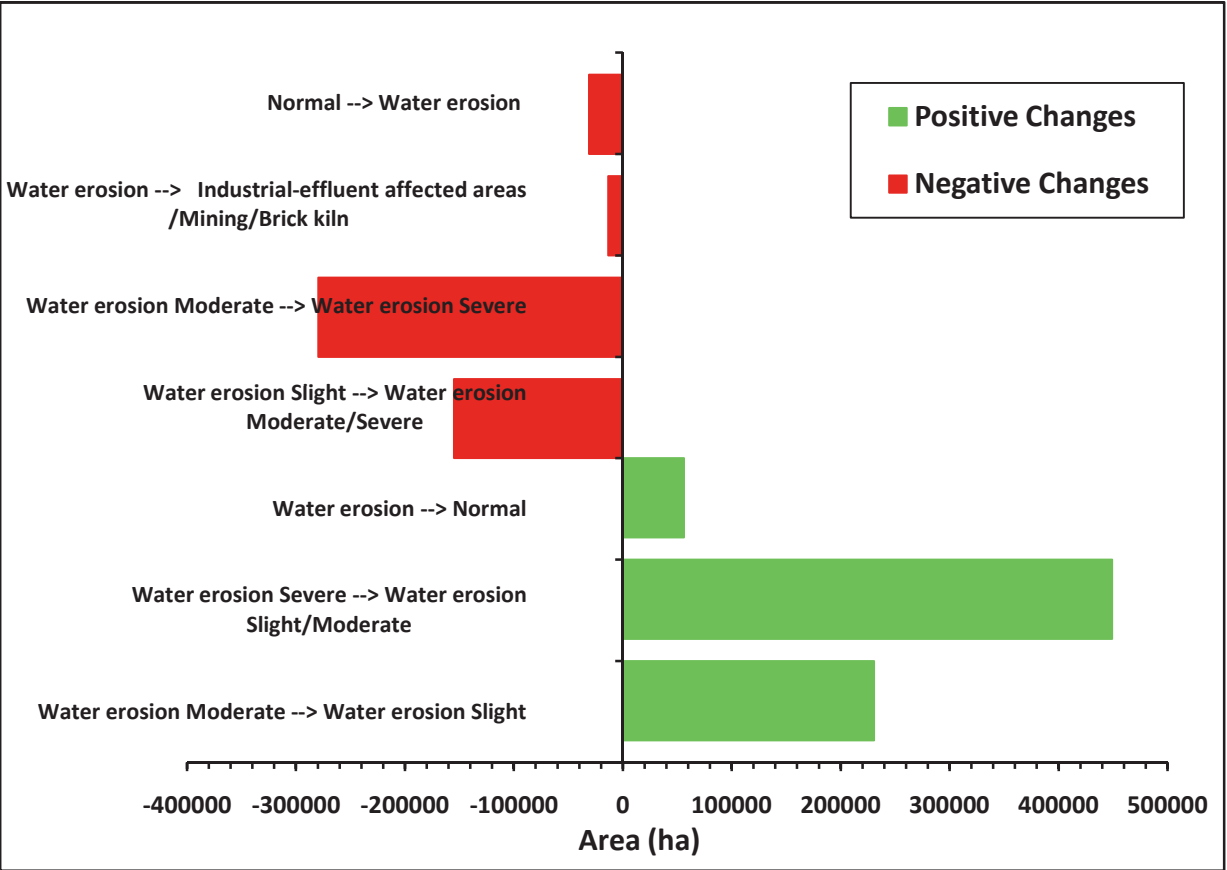


Table 37: Change matrix of land degradation classes in Maharashtra State
(during 2005-06 and 2015-16)

Area in hectares

		2015-16																						
	LD Class	A1	A2	A3	A4	A5	D1	D2	D3	D4	D5	D6	D7	D8	D9	E1	G1	G2	G3	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06
2005-06	A1	810417	128008	26882														203	5		26	5743	971284	11017822
	A2	230629	5625608	279558	81	367											909	6398	730			38045	6182325	
	A3	55126	394158	2871138	143												120	4482	553			12388	3338108	
	A4			2	32841																		32843	
	A5					127170																	127170	
	D1						16883																16883	
	D2							29149															29149	
	D3								19														19	
	D4									64084													64084	
	D5										38653												38653	
	D6											3565											3565	
	D7												25488										25488	
	D8													61									61	
	D9														5531								5531	
	E1															1351							1351	
	G1																103						103	
	G2																	29876				300	30176	
	G3																		475				475	
	H2																			147256		84	149205	
	H3																				1345	4	1349	
	N	6083	16845	8227														328	165				31648	
	Class Total (2015-16)	1102255	6164619	3185807	33065	127537	16883	29149	19	64084	38653	3565	25488	61	5531	1351	1139	43145	1928	147256	1371	56564		
	Total LD area in 2015-16	10992906																						

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 56564 ha (0.51%)
*Normal land to Land degradation: (+) 31648 ha (0.29 %)
*Net decrease : (-) 24916 ha (0.23 %)
Percentage is w.r.t LD of Maharashtra State during 2005-06

Green Denotes Land degradation to Normal land
Red Denotes change from Normal land to Land degradation
Black Denotes no change in Land degradation class
Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 38: Category - wise distribution of land degradation in different districts of Maharashtra State

Area in hectares

	DISTRICTS																							
LD Class	AHMADNAGAR		AKOLA		AMRAVATI		AURANGABAD		BHANDARA		BID		BULDANA		CHANDRAPUR		DHULE		GARHCHIROLI		GONDIYA		HINGOLI	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	54087	51273	5801	7694	25012	18179	21301	17027	19568	30909	4381	7752	12596	18990	114030	145111	19951	16395	267078	310790	121253	122701	753	1872
A2	349066	329612	36670	37330	164988	168049	141680	140842	70036	60176	205475	183388	146939	142985	201886	181787	133168	146501	135312	103456	77068	75772	60036	66796
A3	251452	271455	52543	49052	104007	105779	136287	142883	9982	6942	159734	178126	126218	124947	37791	20374	135968	125710	16699	1685	7921	6389	97717	88791
A4			146	146									174	174	60	60	280	280						
A5	819	819	32541	32541	42161	42161			48	48			35942	35942		367	1340	1340			13	13	108	108
D1	284	284																						
D2																								
D3																								
D4			10979	10979	4352	4352							7924	7924			5757	5757						
D5	2	2			24656	24656																		
D6			1022	1022																				
D7	18456	18456					2850	2850																
D8																								
D9	603	603					878	878																
E1																			1	1				
G1																527								
G2	282	389	377	546	324	647	479	723	356	392	427	980	199	600	12885	15126	135	234		14	129	352	18	348
G3	8	39	9	66	3	34	1	16	6	21	9	582	4	12		9					3	2	9	
H2	28211	28177			27	27	1893	1893	502	500	4917	4900	792	792	1176	1140	7918	7900	147	147	728	721	399	325
H3					295	291													77	101				
Total	703270	701109	140088	139376	365825	364175	305369	307112	100498	98988	374943	375728	330788	332366	367828	364501	304517	304117	419314	416194	207112	205951	159033	158249

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Maharashtra State

Area in hectares

LD Class	DISTRICTS																									
	JALGAON		JALNA		KOLHAPUR		LATUR		MUMBAI CITY		MUMBAI SUBURBAN		NAGPUR		NANDED		NANDURBAR		NASHIK		OSMANABAD		PALGHAR		PARBHANI	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	10853	15674	5223	5244	3648	4253	1853	4707			198	69	20634	56763	13307	27736	27524	22514	61593	26390	1641	8655	29657	29986	4800	4794
A2	165399	160572	161484	165201	170552	160734	219743	204251			121	232	160300	182569	389923	370821	88954	104748	260178	328201	135097	113089	130715	152174	98480	95160
A3	142539	140593	39561	35620	27249	31934	16003	29513			1304	1295	107138	44385	63503	66067	155789	144177	353645	321544	66111	81163	81242	57933	32461	35567
A4	29125	29268													1047	1128			263	263	135	135				
A5	3379	3379	1	1							292	292	582	582	185	185	1491	1491	2507	2507	51	51			820	820
D1					334	334																	3502	3502		
D2											10	10											7731	7731		
D3																										
D4	12473	12473			1277	1277											1015	1015								
D5					868	868													2040	2040						
D6																										
D7																			4182	4182						
D8																										
D9																										
E1																										
G1				10		48							120													
G2	182	389	106	225	500	809	242	632			13	13	4047	4608	169	679	33	340	359	620	155	347	189	265	230	469
G3	10	50	9	14				54						107	64	140	5	10	2	28	4	30	122	255	26	63
H2	2939	2898	6543	6485	2061	1949	764	764					73	73	7548	7436	74	74	8411	8411	7331	7331	149	149	2636	2636
H3									7	7	93	93											297	297		
Total	366899	365296	212927	212800	206489	202206	238605	239921	7	7	2031	2004	292774	289207	475746	474192	274885	274369	693180	694186	210525	210801	253604	252292	139453	139509

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Maharashtra State

Area in hectares

	DISTRICTS																							
LD Class	PUNE		RATNAGIRI		RAYGAD		SANGLI		SATARA		SINDHUDURG		SOLAPUR		THANE		WARDHA		WASHIM		YAVATMAL		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	53916	42691	169	283	4864	2344	9216	6109	5439	2602	708	1667	8401	16044	1952	2138	12399	31507	5577	5659	21901	35733	971284	1102255
A2	478399	459434	166095	185007	217223	265244	296149	273118	389431	384927	140119	138307	271736	242614	49357	83059	146925	139411	69986	72064	253635	246988	6182325	6164619
A3	116187	138268	176731	157556	110410	64646	71790	97601	68018	74429	49769	50238	83437	114829	149576	112633	44748	31327	74960	71731	169618	160625	3338108	3185807
A4	49	49					813	813	118	118			174	172							459	459	32843	33065
A5			15	15			1251	1251	29	29	8	8	140	140			1037	1037	317	317	2093	2093	127170	127537
D1	4906	4906	2677	2677	1020	1020	135	135	851	851	197	197	2551	2551	426	426							16883	16883
D2			477	477	13244	13244			1102	1102	1748	1748	184	184	4653	4653							29149	29149
D3					19	19																	19	19
D4	1196	1196	250	250	6036	6036	8409	8409	207	207			4209	4209									64084	64084
D5	1008	1008			137	137	3121	3121					6821	6821									38653	38653
D6	145	145			101	101	1135	1135					1162	1162									3565	3565
D7																							25488	25488
D8					61	61																	61	61
D9	256	256			2929	2929							865	865									5531	5531
E1											1350	1350											1351	1351
G1	1	1		7					72	246							30	84				96	103	1139
G2	688	2586	98	240	325	399	18	80	295	391	477	855	752	1460	463	474	435	675	69	265	4720	5973	30176	43145
G3	1	11		3	6	30									94	181	87	115	3	8		38	475	1928
H2	8834	7808	12746	12707	1685	1685	7103	7103	6647	6632	14432	14258	7765	7765	48	48	15	15	318	318	4373	4189	149205	147256
H3			158	158	205	205					217	219											1349	1371
Total	665586	658359	359416	359380	358265	358100	399140	398875	472209	471534	209025	208847	388197	398816	206569	203612	205676	204171	151230	150362	456799	456194	11017822	10992906

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Ahmadnagar District (701109 ha, 41% of district TGA)

Maximum changes in land degradation:-SolapurDistrict (+10619 ha, 0.1% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

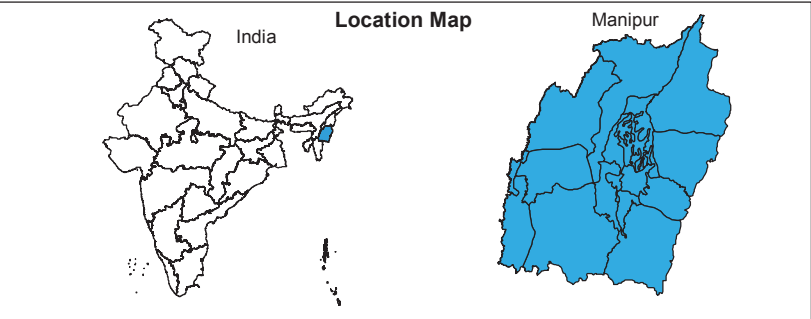
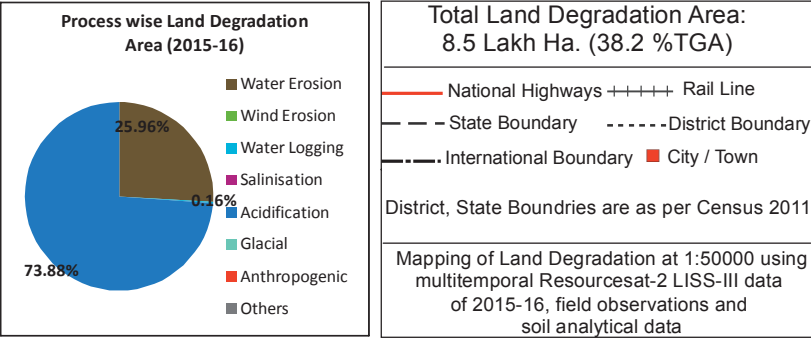
LAND DEGRADATION MAP OF MANIPUR
2015-16

ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		68161
2		A2	Sheet erosion - Moderate		65043
3		A3	Sheet erosion - Severe		88727
4		A4	Rills		
5		A5	Gullies		
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		1343
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisatation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		631463
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		
24		G2	Mining and dump areas		
25		G3	Brick kiln		
26	Others	H1	Mass movement / mass wastage		239
27		H2	Barren rocky / Stony waste		
28		H3	RiverineSands/Sea Ingress etc		

Note: White colour in map indicates either no apparent degradation or normal land.



Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination North Eastern Space Application Centre (NESAC),Umiam-793103 (Meghalaya)	Partner Institution(s) Manipur RS Application Centre (MARSAC), New Secretariat Building, Imphal – 795 001
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Fig. 18

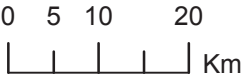
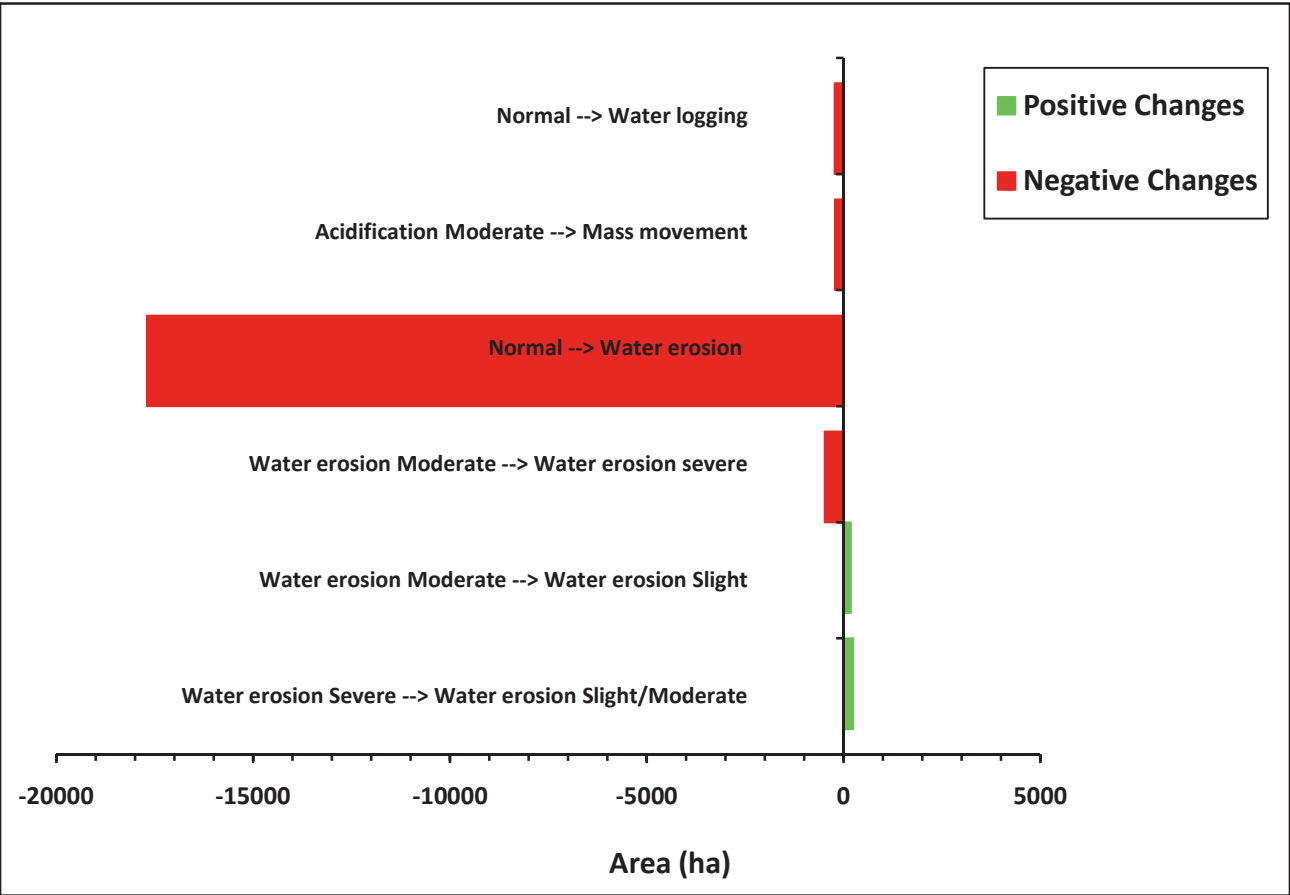


Table 39: Change matrix of land degradation classes in Manipur State
(during 2005-06 and 2015-16)

Area in hectares

		2015-16									
	LD Class	A1	A2	A3	C1	C2	E1	H1	H2	Class Total (2005-06)	Total LD area in 2005-06
2005-06	A1	60116	60							60176	837056
	A2	191	55470	481						56142	
	A3	209	38	87669						87916	
	C1				1011					1011	
	C2					105				105	
	E1						631463	221		631684	
	H2								22	22	
	N	7645	9475	577		227		18		17942	
	Class Total (2015-16)	68161	65043	88727	1011	332	631463	239	22		
	Total LD area in 2015-16	854998									

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 0 ha (0 %)
 Green Denotes Land degradation to Normal land

*Normal land to Land degradation: (+) 17942 ha (2.14 %)
 Red Denotes change from Normal land to Land degradation

*Net increase : (+) 17942 ha (2.14 %)
 Black Denotes no change in Land degradation class

Percentage is w.r.t LD of Manipur State during
 Blue Denotes inter-class change

2005-06

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 40: Category - wise distribution of land degradation in different districts of Manipur State

Area in hectares

LD Class	DISTRICTS																			
	BISHNUPUR		CHANDEL		CHURACHANDPUR		IMPHAL EAST		IMPHAL WEST		SENAPATI		TAMENGLONG		THOUBAL		UKHRUL		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	223	223	7517	7831	31425	33125	3910	3910		142	13419	14194	6	3244	815	755	2861	4737	60176	68161
A2			174	984	38893	40887	108	108	2579	2560		702	14215	16718	173	233		2851	56142	65043
A3			9323	9373	37626	37559					24021	24021	13028	13622	167	167	3751	3985	87916	88727
C1	1011	1011																	1011	1011
C2		227									105	105							105	332
E1	1573	1573	136265	136265	77323	77323	13718	13718	775	775	184751	184530	55230	55230	13445	13445	148604	148604	631684	631463
H1						8						231								239
H2													22	22					22	22
Total	2807	3034	153279	154453	185267	188902	17736	17736	3354	3477	222296	223783	82501	88836	14600	14600	155216	160177	837056	854998

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Senapati District (223783 ha, 68.4% of district TGA)

Maximum changes in land degradation:-Tamenglong District (+6355 ha, 0.76% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

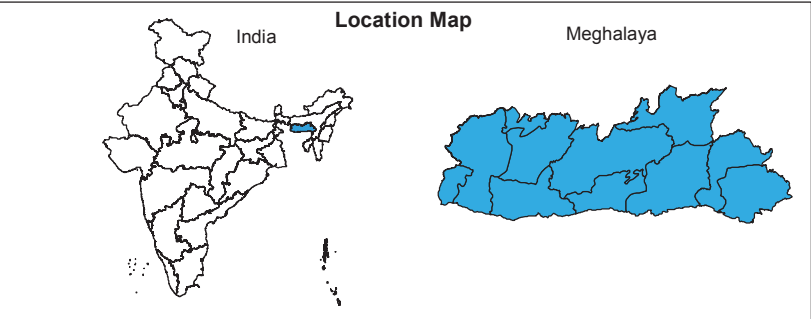
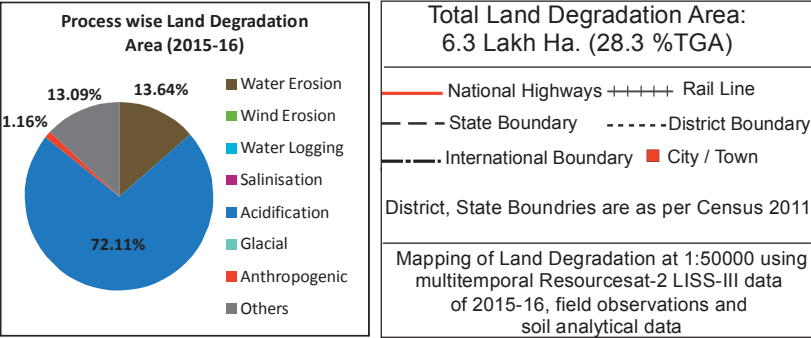
LAND DEGRADATION MAP OF MEGHALAYA
2015-16

ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		28044
2		A2	Sheet erosion - Moderate		21140
3		A3	Sheet erosion - Severe		5
4		A4	Rills		37578
5		A5	Gullies		
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		293
15		C3	Subsurface waterlogged		11
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		458765
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		7387
23	Anthropogenic	G1	Industrial effluent affected areas		
24		G2	Mining and dump areas		
25		G3	Brick kiln		82567
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		
28		H3	RiverineSands/Sea Ingress etc		697

Note: White colour in map indicates either no apparent degradation or normal land.



Project Execution	Regional Coordination	Partner Institution(s)
Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	North Eastern Space Application Centre (NESAC),Umiam-793103 (Meghalaya)	North Eastern Space Application Centre (NESAC),Umiam-793103 (Meghalaya)

Fig. 19

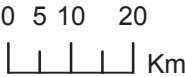
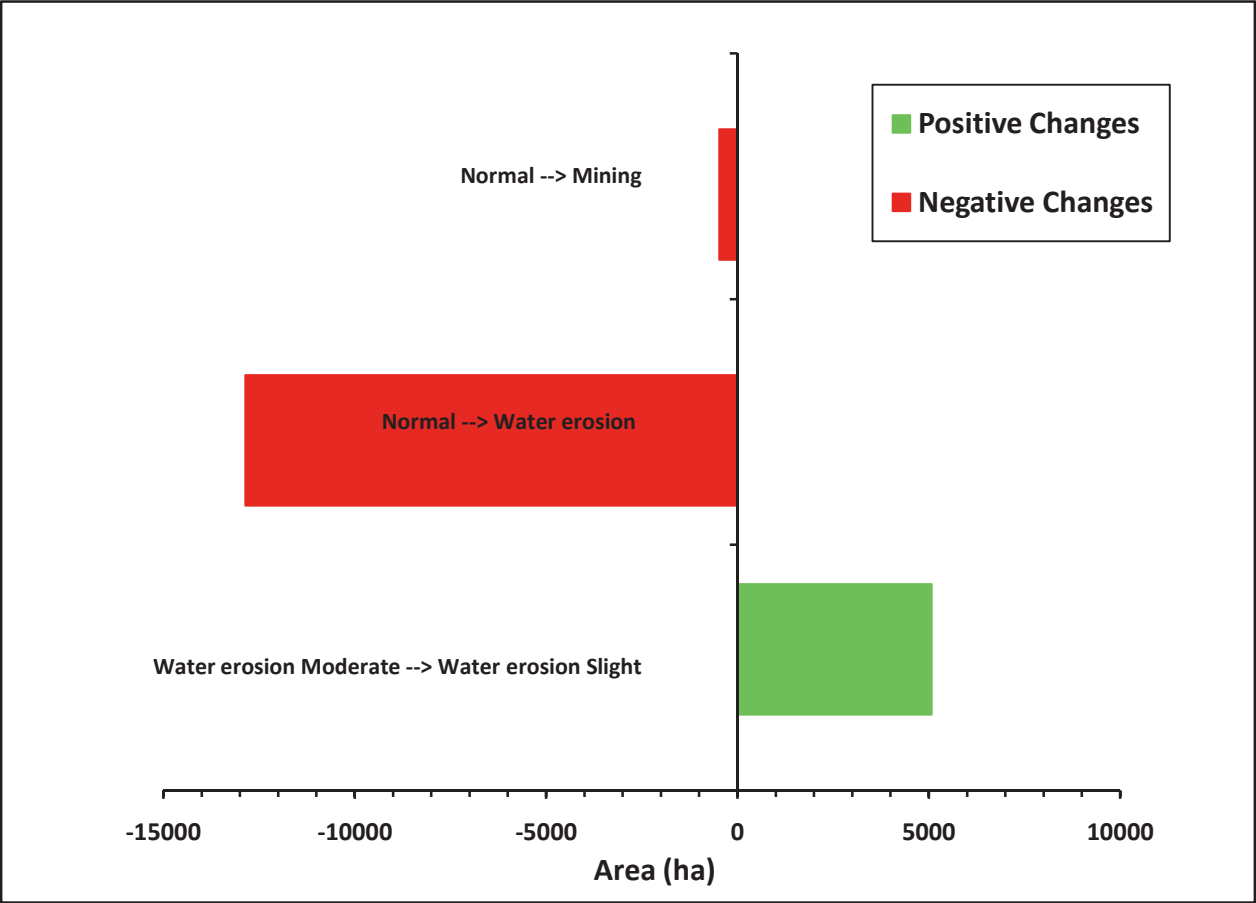


Table 41: Change matrix of land degradation classes in Meghalaya State
(during 2005-06 and 2015-16)

Area in hectares													
	LD Class	2015-16											Total LD area in 2005-06
		A1	A2	A5	C1	C2	C3	E1	E2	G2	H2	H3	
2005-06	A1	14388	101										14489
	A2	5073	16765										21838
	A5			37578									37578
	C1				258								258
	C2					35							35
	C3						11						11
	E1							370108					370108
	E2							6776	81881				88657
	G2									6910			6910
	H2										82567		82567
	H3											697	697
	N	8583	4279							477			13339
	Class Total (2015-16)	28044	21145	37578	258	35	11	376884	81881	7387	82567	697	
	Total LD area in 2015-16	636487											

Significant land degradation changes between 2005-06 and 2015-16



•Land degradation to Normal land : (-) 0 ha (0 %)
•Normal land to Land degradation: (+) 13339 ha (2.14 %)
•Net increase : (+) 13339 ha (2.14 %)
Percentage is w.r.t LD of Meghalaya State during 2005-06

Green Denotes Land degradation to Normal land
Red Denotes change from Normal land to Land degradation
Black Denotes no change in Land degradation class
Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 42: Category - wise distribution of land degradation in different districts of Meghalaya State

Area in hectares

	DISTRICTS																							
LD Class	EAST GARO HILLS		EAST JAINTIA HILLS		EAST KHASI HILLS		NORTH GARO HILLS		RIBOHI		SOUTH GARO HILLS		SOUTH WEST GARO HILLS		SOUTH WEST KHASI HILLS		WEST GARO HILLS		WEST JAINTIA HILLS		WEST KHASI HILLS		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1		859	32	993	268	352		19	42	534	3165	8429		59	2146	2750		3382		51	8836	10616	14489	28044
A2	2	709	42	463	3479	3408		62	53	368	8736	5532		104	2514	2243		1529	13	30	6999	6697	21838	21145
A5			34162	34162	80	80													3336	3336			37578	37578
C1							97	97	27	27							134	134					258	258
C2																	35	35					35	35
C3															11	11							11	11
E1	36309	41224	26491	26491	51236	51236	20843	20843	44904	44904	7394	7394	7725	7725	24213	24213	44128	45989	32733	32733	74132	74132	370108	376884
E2	68747	63832					7230	7230			161	161					10613	8752	1807	1807	99	99	88657	81881
G2			6521	6594	39	116			8	18						56			322	534	20	69	6910	7387
H2			385	385	21465	21465					601	601			24846	24846			395	395	34875	34875	82567	82567
H3			9	9	200	200									354	354			78	78	56	56	697	697
Total	105058	106624	67642	69097	76767	76857	28170	28251	45034	45851	20057	22117	7725	7888	54084	54473	54910	59821	38684	38964	125017	126544	623148	636487

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in West Khasi Hills District (126544 ha, 24% of district TGA)

Maximum changes in land degradation:-West Garo Hills District (+4991 ha, 0.8 % of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF MIZORAM
2015-16

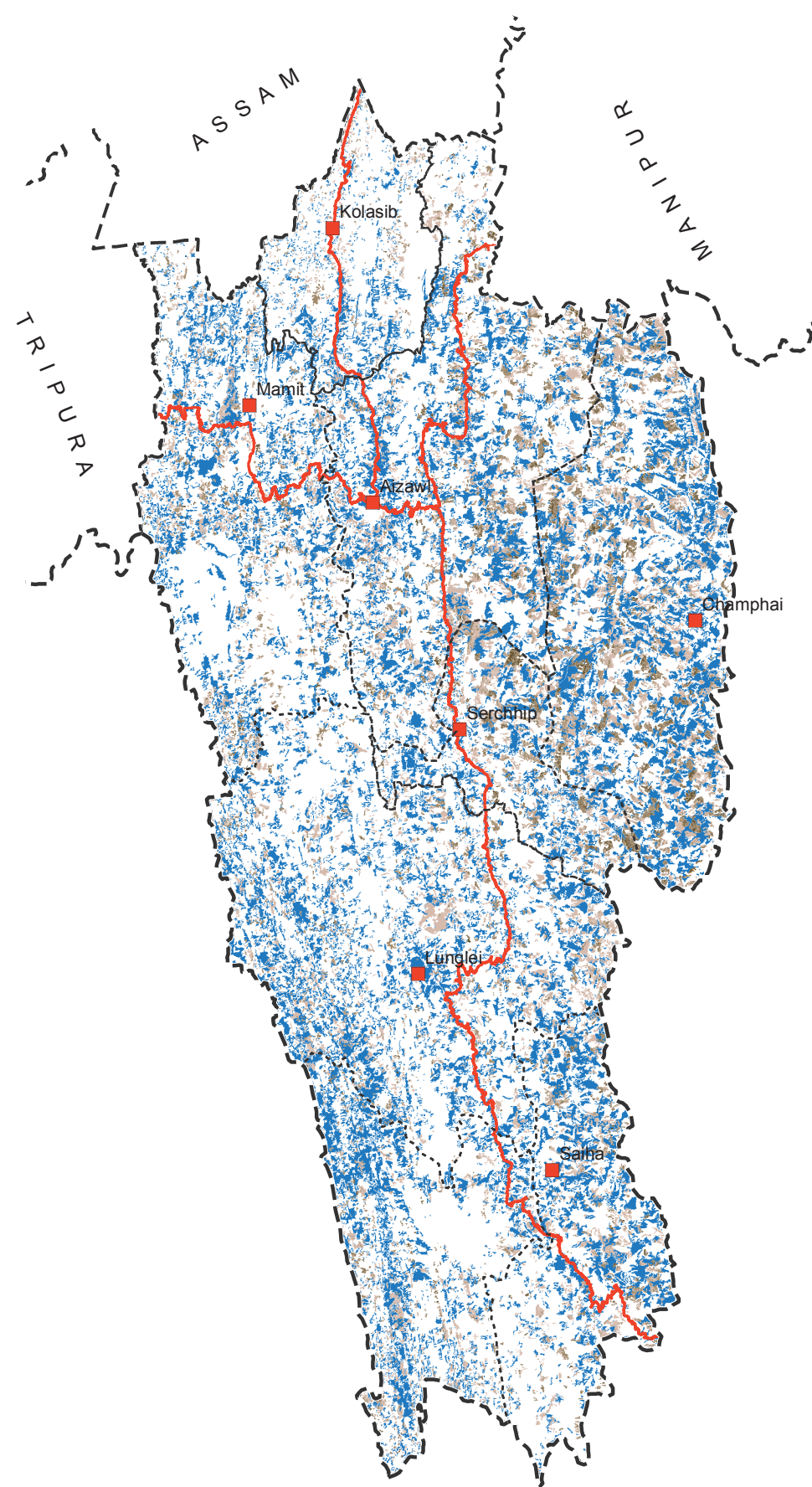
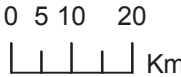


Fig. 20

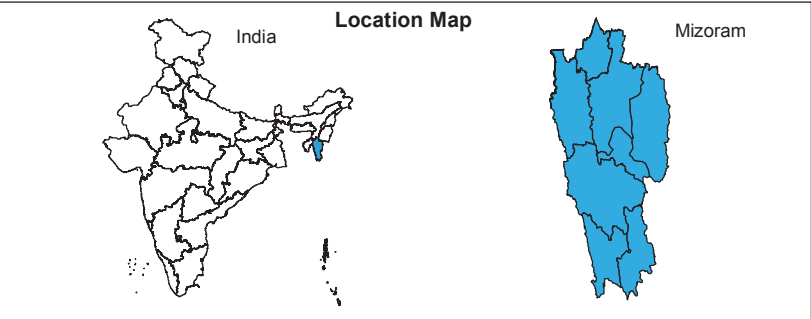
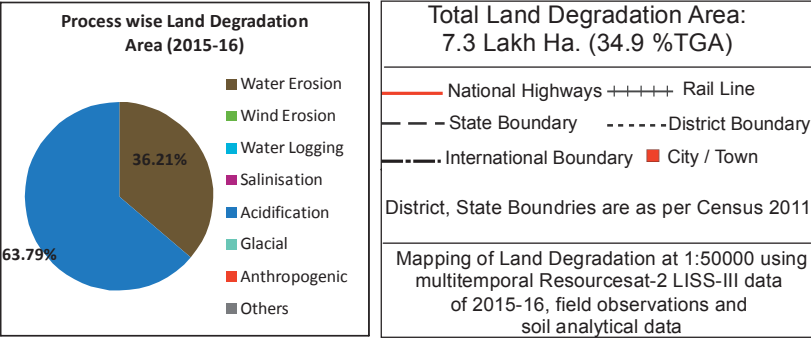


ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		165773
2		A2	Sheet erosion - Moderate		78823
3		A3	Sheet erosion - Severe		21560
4		A4	Rills		421
5		A5	Gullies		
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		469594
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		
24		G2	Mining and dump areas		
25		G3	Brick kiln		
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		
28		H3	RiverineSands/Sea Ingress etc		

Note: White colour in map indicates either no apparent degradation or normal land.

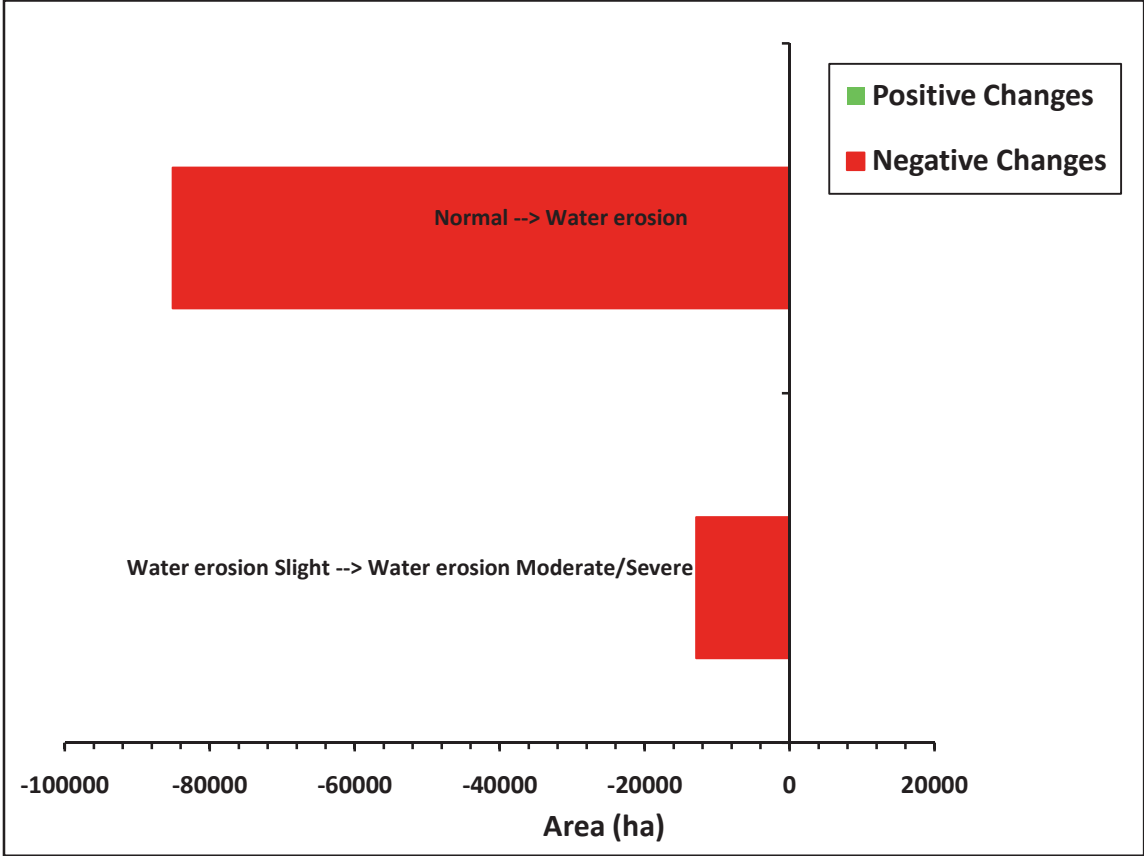


Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination North Eastern Space Application Centre (NESAC),Umiam-793103 (Meghalaya)	Partner Institution(s) Mizoram Remote Sensing, Application Centre, S&T, Planning Dept, CHALTLANG – 796 012, Aizawl, Mizoram
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**Table 43: Change matrix of land degradation classes in Mizoram State
(during 2005-06 and 2015-16)**

		Area in hectares							
		2015-16							
	LD Class	A1	A2	A3	A4	E1	E2	Class Total (2005-06)	Total LD area in 2005-06
2005-06	A1	131251	10190	2698				144139	651062
	A2		28543					28543	
	A3			8365				8365	
	A4				136			136	
	E1				285	469275	234	469794	
	E2						85	85	
	N	34522	40090	10497				85109	
	Class Total (2015-16)	165773	78823	21560	421	469275	319		
	Total LD area in 2015-16	736171							

Significant land degradation changes between 2005-06 and 2015-16



•Land degradation to Normal land : (-) 0 ha (0 %)
 •Normal land to Land degradation: (+) 85109 ha (13.07 %)
 •Net increase : (+) 85109 ha (13.07 %)
 # Percentage is w.r.t LD of Mizoram State during 2005-06

Green Denotes Land degradation to Normal land
 Red Denotes change from Normal land to Land degradation
 Black Denotes no change in Land degradation class
 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 44: Category - wise distribution of land degradation in different districts of Mizoram State

Area in hectares

	DISTRICTS																	
LD Class	AIZAWL		CHAMPHAI		KOLASIB		LAWANGTLAI		LUNGLEI		MAMIT		SAIHA		SERCHHIP		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	28222	31344	41897	41005	3181	5267	8652	11555	23456	30581	13058	17370	13341	14588	12332	14063	144139	165773
A2	5464	15158	11123	24090	203	2108	1441	4958	3282	11037	2175	8234	2324	5906	2531	7332	28543	78823
A3	1433	4696	4334	9028	59	264	226	816	285	939	501	1684	612	1389	915	2744	8365	21560
A4	62	92		150	39	39				29	35	65		27		19	136	421
E1	82514	82484	96285	96135	16692	16504	47748	47748	96408	96379	58311	58281	45287	45260	26549	26484	469794	469275
E2	41	41				188							14	14	30	76	85	319
Total	117736	133815	153639	170408	20174	24370	58067	65077	123431	138965	74080	85634	61578	67184	42357	50718	651062	736171

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Champhai District (170408 ha, 53.5 % of district TGA)

Maximum changes in land degradation:-Champhai District (+16769 ha, 2.58% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

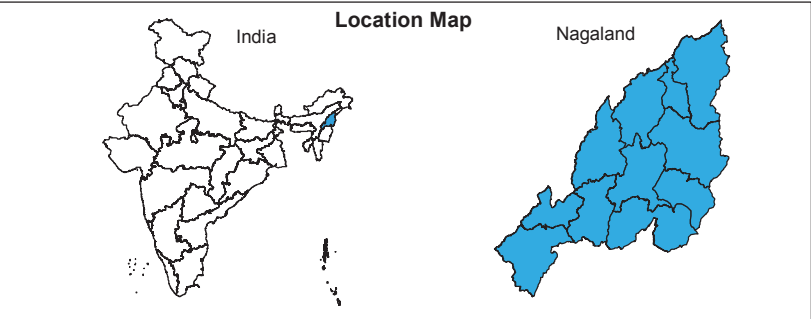
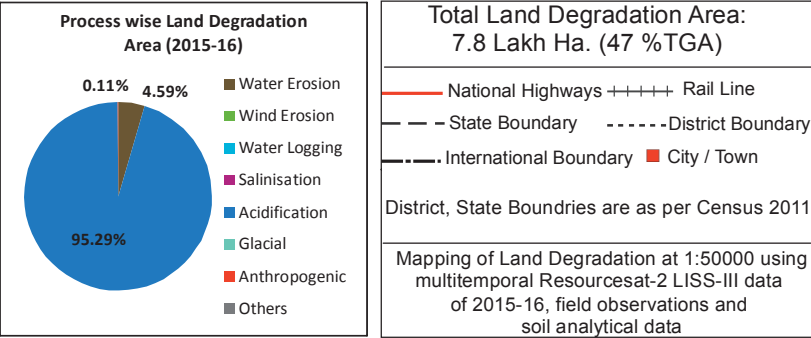
LAND DEGRADATION MAP OF NAGALAND
2015-16

ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		28288
2		A2	Sheet erosion - Moderate		7267
3		A3	Sheet erosion - Severe		288
4		A4	Rills		
5		A5	Gullies		
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisiation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		743388
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		
24		G2	Mining and dump areas		888
25		G3	Brick kiln		
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		
28		H3	RiverineSands/Sea Ingress etc		

Note: White colour in map indicates either no apparent degradation or normal land.



Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination North Eastern Space Application Centre (NESAC),Umiam-793103 (Meghalaya)	Partner Institution(s) Nagaland Sci. & Tech. Council (NASTEC), Sci. & Tech.Complex, Below New Civil Sctr. KOHIMA – 797 004
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Fig. 21

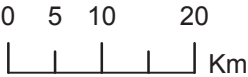
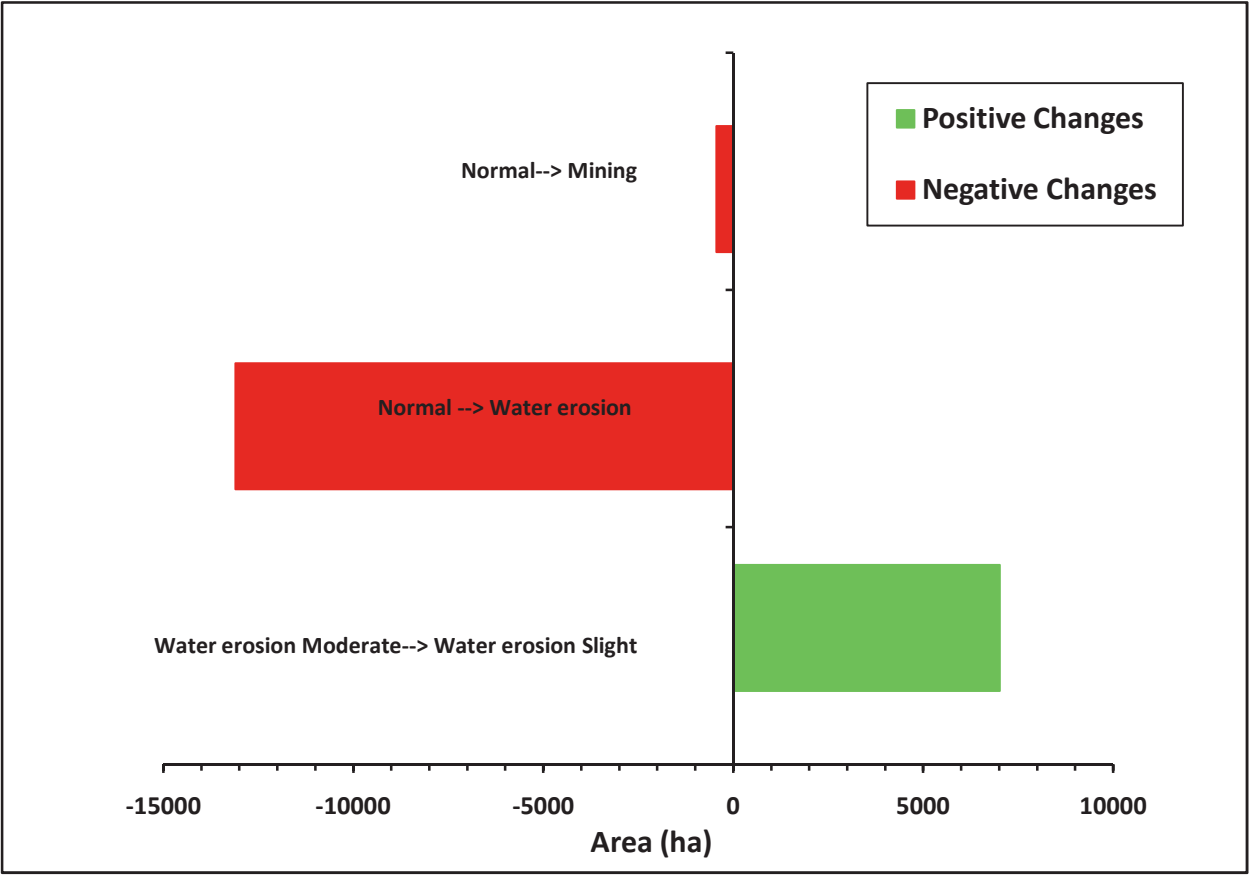


Table 45: Change matrix of land degradation classes in Nagaland State
(during 2005-06 and 2015-16)

Area in hectares									
		2015-16							
	LD Class	A1	A2	A3	E1	E2	G2	Class Total (2005-06)	Total LD area in 2005-06
2005-06	A1	13097						13097	766572
	A2	7018	2540	85				9643	
	E1				675536	625		676161	
	E2					67227	35	67262	
	G2						409	409	
	N	8173	4727	203			444	13547	
	Class Total (2015-16)	28288	7267	288	675536	67852	888		
	Total LD area in 2015-16	780119							

Significant land degradation changes between 2005-06 and 2015-16



•Land degradation to Normal land : (-) 0 ha (0 %)
•Normal land to Land degradation: (+) 13547 ha (1.77 %)
•Net increase : (+) 13547 ha (1.77 %)
Percentage is w.r.t LD of Nagaland State during 2005-06

Green Denotes Land degradation to Normal land
Red Denotes change from Normal land to Land degradation
Black Denotes no change in Land degradation class
Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 46: Category - wise distribution of land degradation in different districts of Nagaland State

Area in hectares

	DISTRICTS																							
LD Class	DIMAPUR		KIPHIRE		KOHIMA		LONGLENG		MOKOKCHUNG		MON		PEREN		PHEK		TUENSANG		WOKHA		ZUNHEBOTO		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	3123	3258	313	1351		969	138	700	892	1304	873	5432	6151	8738	60	334	329	1477	1218	4156		569	13097	28288
A2				322	812	453		238		216	1654	1620	2355	114	107	348	786	1054	3929	2221		681	9643	7267
A3						207								42		39								288
E1	18398	18398	62779	62779	44383	44383	21977	21977	42987	42908	81822	81822	50386	50386	101432	101432	118604	118204	56706	56560	76687	76687	676161	675536
E2	1554	1554	1468	1468	1605	1605	2816	2781	14779	14858	17099	17099	3739	3739	7413	7413	7721	8121	2543	2689	6525	6525	67262	67852
G2							2	223		6	407	659											409	888
Total	23075	23210	64560	65920	46800	47617	24933	25919	58658	59292	101855	106632	62631	63019	109012	109566	127440	128856	64396	65626	83212	84462	766572	780119

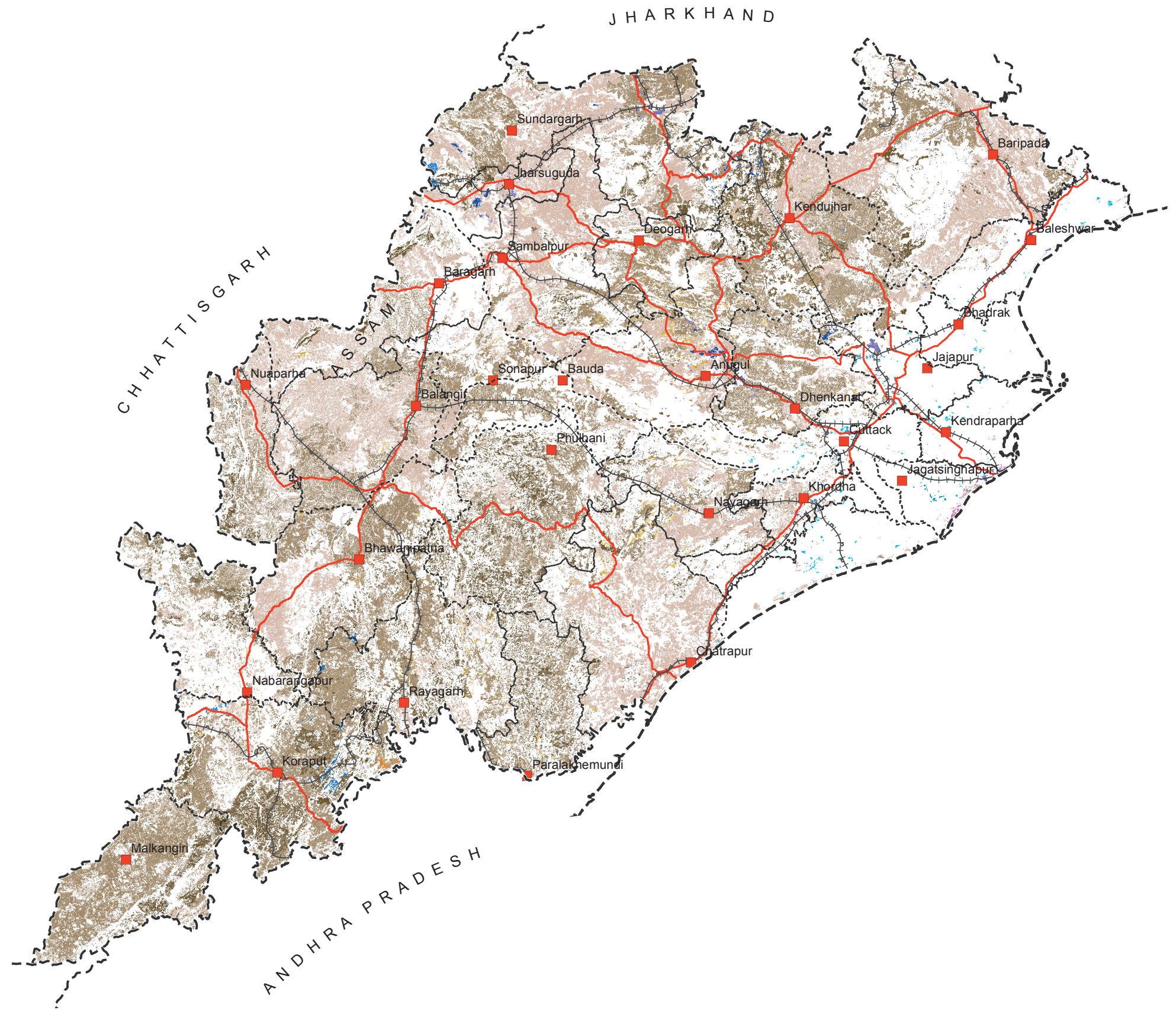
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Tuensang District (128856 ha, 51% of district TGA)

Maximum changes in land degradation:- Mon District (+4777 ha, 0.62% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF ODISHA
2015-16



ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		2177222
2		A2	Sheet erosion - Moderate		2744304
3		A3	Sheet erosion - Severe		843603
4		A4	Rills		428
5		A5	Gullies		65027
6		A6	Ravines-Shallow		2397
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		335
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		13938
15		C3	Subsurface waterlogged		2153
16	Salinisation / Alkalisiation	D1-D3	Saline - Slight/Moderate/Severe		2209
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		848
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		18835
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		13703
24		G2	Mining and dump areas		20004
25		G3	Brick kiln		663
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		55695
28		H3	RiverineSands/Sea Ingress etc		5753

Note: White colour in map indicates either no apparent degradation or normal land.

Process wise Land Degradation Area (2015-16)

Water Erosion	97.81%
Wind Erosion	0.32%
Water Logging	0.58%
Salinisation	1.03%
Acidification	
Glacial	
Anthropogenic	
Others	

Total Land Degradation Area: 59.6 Lakh Ha. (38.3 %TGA)

— National Highways +++++ Rail Line
- - - State Boundary - - - - - District Boundary
- - - - - International Boundary ■ City / Town

District, State Boundries are as per Census 2011

Mapping of Land Degradation at 1:50000 using multitemporal Resourcesat-2 LISS-III data of 2015-16, field observations and soil analytical data

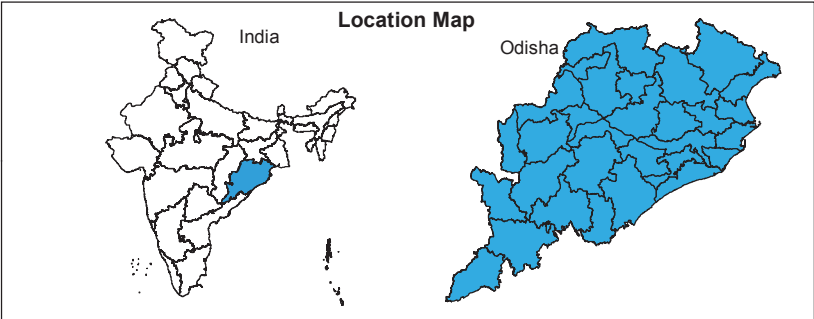
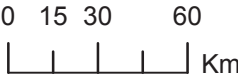


Fig. 22



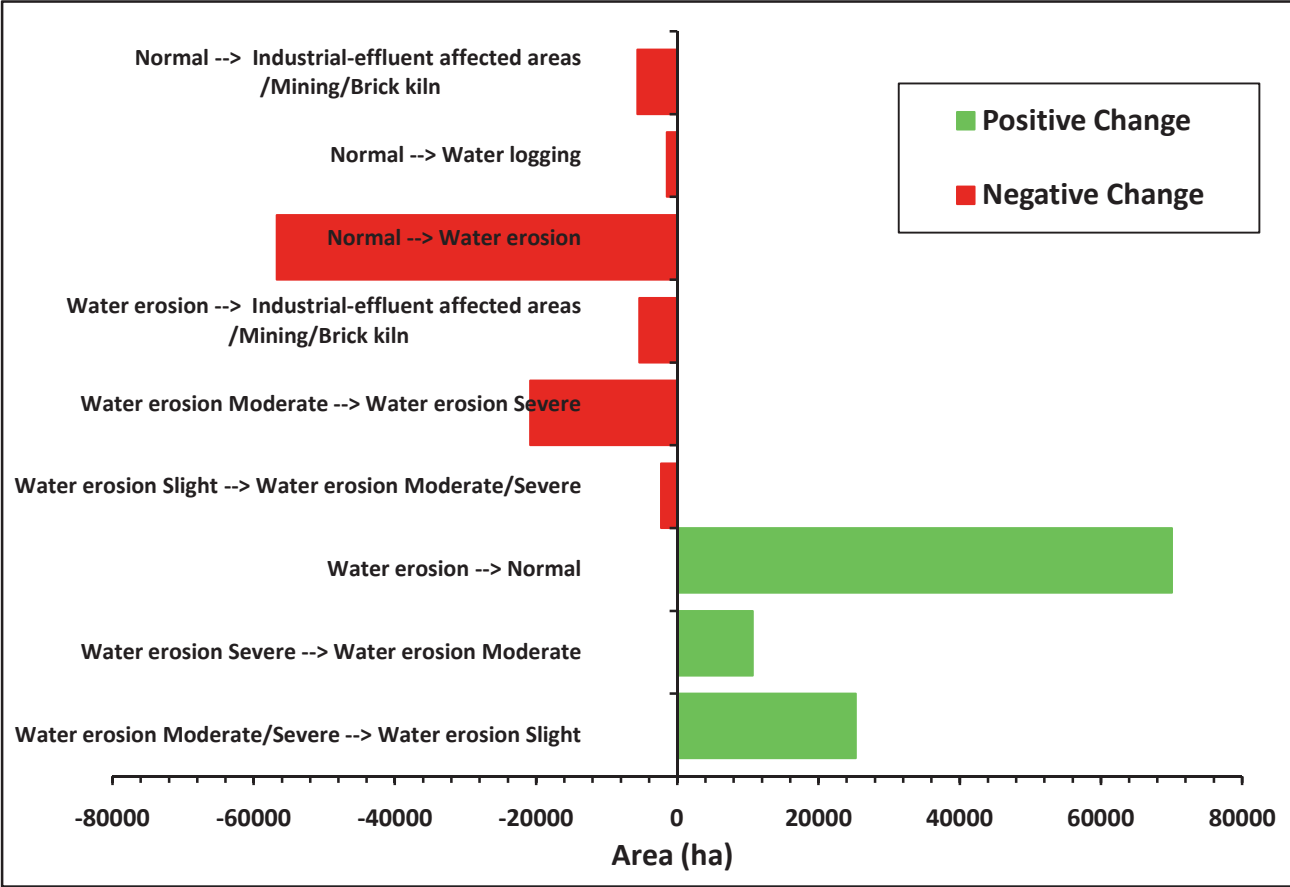
Project Execution	Regional Coordination	Partner Institution(s)
Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Remote Sensing Centre – Central,NBSS & LUP Campus, Nagpur-440010	Odisha Space Application Centre, Dept. of Sci. & Tech. Government of Odisha, Bhubaneswar – 751023

Table 47: Change matrix of land degradation classes in Odisha State
(during 2005-06 and 2015-16)

Area in hectares

		2015-16																					
	LD Class	A1	A2	A3	A4	A5	A6	B4	C1	C2	C3	D2	D7	E1	G1	G2	G3	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06	
2005-06	A1	2143601	2043	257											905	2335	14			18780	2167935	5973291	
	A2	21459	2713367	20863											963	553				37794	2794999		
	A3	3825	10686	792277											66	562				13518	820934		
	A4				428																428		
	A5					65027															65027		
	A6						2397														2397		
	B4							335													335		
	C1								10464	6										30	10500		
	C2										2525										2525		
	C3											1590								83	1673		
	D2												2209								2209		
	D7													848						9	857		
	E1														18835						18835		
	G1															8689					8689		
	G2																14035						14035
	G3																	507					507
	H2															63		55695					55758
	H3																		5645	3			5648
N	8337	18208	30206						653	290	563				3080	2456	142		108		64043		
	Class Total (2015-16)	2177222	2744304	843603	428	65027	2397	335	11117	2821	2153	2209	848	18835	13703	20004	663	55695	5753	70217			
	Total LD area in 2015-16	5967117																					

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 70217ha (1.18 %)
 Green Denotes Land degradation to Normal land

*Normal land to Land degradation: (+) 64043 ha (1.07 %)
 Red Denotes change from Normal land to Land degradation

*Net decrease (-) 6174 ha (0.10 %)
 Black Denotes no change in Land degradation class

Percentage is w.r.t LD of Odisha State during 2005-06
 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 48: Category - wise distribution of land degradation in different districts of Odisha State

Area in hectares

LD Class	DISTRICTS																					
	ANUGUL		BALANGIR		BALESHWAR		BARAGARH		BAUDA		BHADRAK		CUTTACK		DEOGARH		DHENKANAL		GAJAPATI		GANJAM	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	160008	158197	187886	189040	12673	12648	124689	124657	8799	8641	40	40	6430	6760	14130	14540	19429	19087	1595	1747	255003	250791
A2	89370	85224	172963	172044	2764	2722	68143	67977	92783	88120			11530	11026	90875	90227	148936	146785	105187	90904	38390	36564
A3	13914	13606	2584	2465	1103	1103	14739	14691	4649	4649			3979	3930	6663	6695	8202	8193	38003	56021	21648	22464
A4	124	124											303	303			1	1				
A5	12961	12961	980	980	185	185	881	881					292	292	3102	3102	3391	3391	2058	2058	8029	8029
A6																						
B4					335	335																
C1					1318	1372					643	702	1943	2127			7	7	170	170	99	99
C2					55	61					4	4	1031	1031							22	22
C3	48	48				25																
D2																						
D7																						
E1													536	536			135	135				
G1	874	1266			923	923											806	1696				
G2	2009	3644	173	173	237	237	167	232					173	180	24	24	84	149	6	6	38	39
G3							13	13					365	402			40	40				
H2	610	610	3886	3886	293	293	732	732	863	863			241	241	326	326	1174	1174	4250	4250	3857	3857
H3	45	45	2	2	414	414	78	78	5	5					12	12					1565	1565
Total	279963	275725	368474	368590	20300	20318	209442	209261	107099	102278	687	746	26823	26828	115132	114926	182205	180658	151269	155156	328651	323430

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Odisha State

Area in hectares

LD Class	DISTRICTS																					
	JAGATSINGHAPUR		JAJAPUR		JHARSUGUDA		KALAHANDI		KENDRAPARHA		KENDUJHAR		KHORDHA		KORAPUT		MALKANGIRI		MAYURBHANJ		NABARANGAPUR	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	1154	972	3717	3538	94216	92985	110796	111366	989	986	135831	137043	27174	27633	17841	18636	2900	4857	289699	290040	17341	18317
A2	1370	1098	6283	6256	2693	3137	216092	214675	197	197	228149	223811	16160	13636	242298	242862	272679	266265	141203	141129	75734	73943
A3			6820	6832	8011	7485	20440	23216			103562	98878	1044	1044	141315	138347	46267	44741	28589	28488	40769	41429
A4																						
A5			9	9	106	106	2219	2219			6690	6690	50	50	3415	3415	144	144	36	36	702	702
A6			23	23											2374	2374						
B4																						
C1	265	253	1922	1976					1777	1978			212	212					59	59	2	2
C2	11	236	330	330			8	8	115	115			354	354							2	2
C3	1204	1616																				
D2	1436	1436							773	773												
D7	857	848																				
E1			1269	1269	3	3	774	774			365	365	963	963	7063	7063	110	110			1512	1512
G1	538	1180	1874	2984	989	2333		26			206	284	58	58	262	282						
G2			2003	2435	1956	2590					2886	4043	464	827	260	260	95	95	127	245	5	5
G3	8	8		98									76	76					5	18		
H2			313	250	86	86	5344	5344			3904	3904	449	449	2977	2977	4095	4095	8252	8252	460	460
H3	623	731			9	9	870	867	671	671					4	4	13	13	41	41	18	18
Total	7466	8378	24563	26000	108069	108734	356543	358495	4522	4720	481593	475018	47004	45302	417809	416220	326303	320320	468011	468308	136545	136390

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Odisha State

Area in hectares

LD Class	DISTRICTS																	
	NAYAGARH		NUAPARHA		PHULABANI (KANDHAMAL)		PURI		RAYAGARH		SAMBALPUR		SONAPUR		SUNDARGARH		Total	
	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16	2005-06	2015-16
A1	90953	90439	44376	45720	28042	28089	5711	6830	34713	36408	238565	237150	30270	30221	202965	209844	2167935	2177222
A2	42363	41470	83999	80531	111702	112641	2994	1329	205421	205969	59654	60134	55166	53846	209901	209782	2794999	2744304
A3	13935	13399	29933	29854	138693	150383			58148	59452	17467	17175	2438	2723	48019	46340	820934	843603
A4																	428	428
A5	3795	3795	35	35	215	215			10126	10126	3426	3426	1433	1433	747	747	65027	65027
A6																	2397	2397
B4																	335	335
C1			4	4			2073	2150			6	6					10500	11117
C2			34	34			533	596						2	26	26	2525	2821
C3							421	464									1673	2153
D2																	2209	2209
D7																	857	848
E1			262	262					1369	1369					4474	4474	18835	18835
G1		41							3	27	154	154			2002	2449	8689	13703
G2							205	247	9	14	170	348			2944	4211	14035	20004
G3										8							507	663
H2	5466	5466	1806	1806	1519	1519			1544	1544	479	479	1551	1551	1281	1281	55758	55695
H3			6	6			1242	1242	4	4	2	2	24	24			5648	5753
Total	156512	154610	160455	158252	280171	292847	13179	12858	311337	314921	319923	318874	90882	89800	472359	479154	5973291	5967117

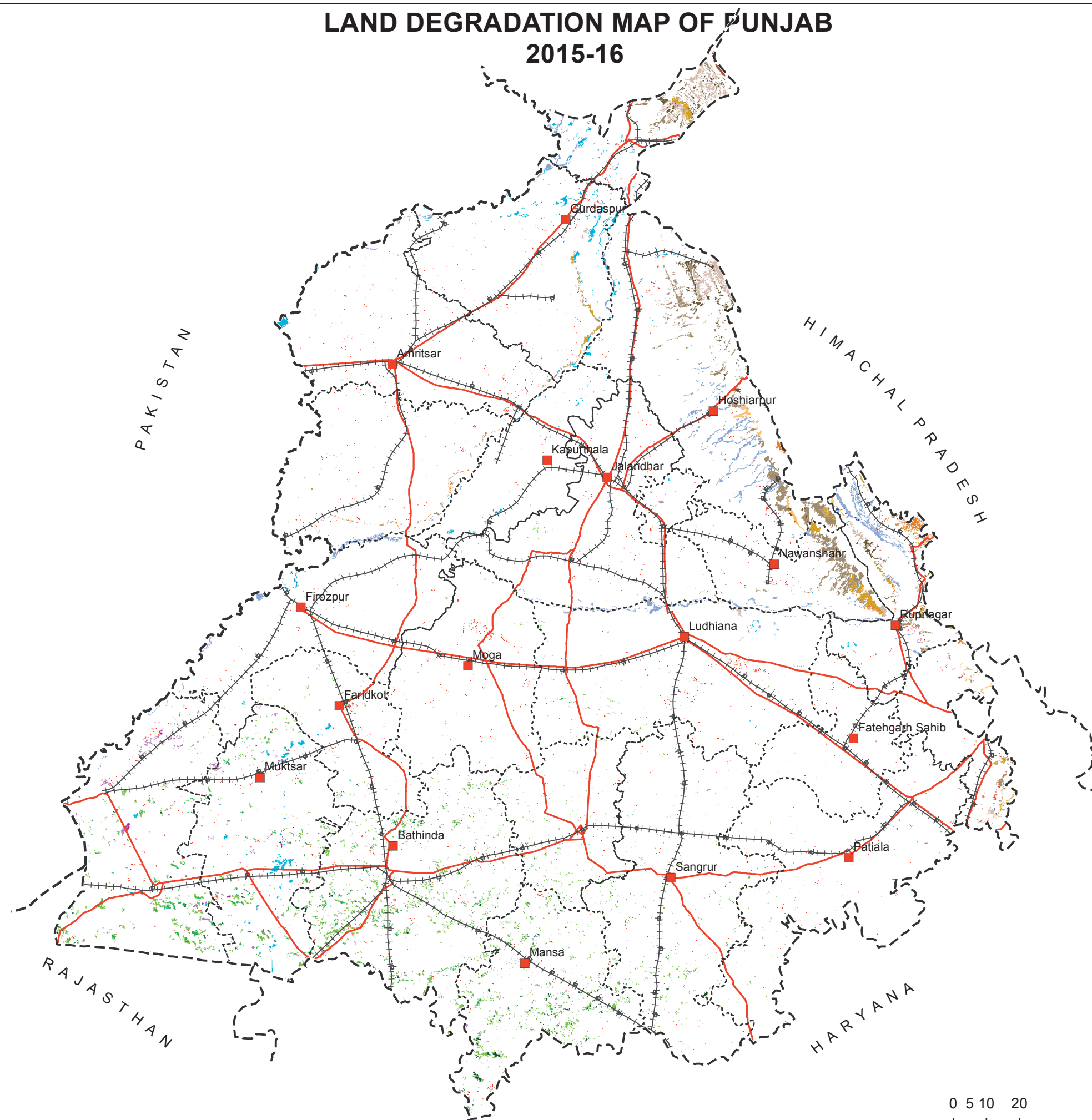
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Kendujhar District (475018 ha, 57% of district TGA)

Maximum changes in land degradation:-Phulabani District (+12676 ha, 0.21% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF PUNJAB 2015-16

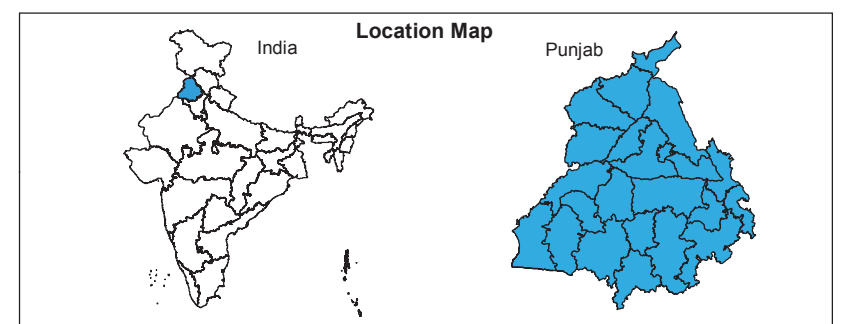
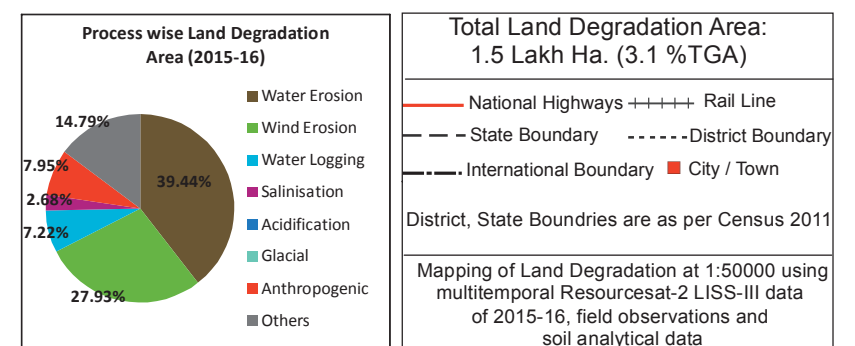


ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		12447
2		A2	Sheet erosion - Moderate		25280
3		A3	Sheet erosion - Severe		7871
4		A4	Rills		3019
5		A5	Gullies		8452
6		A6	Ravines-Shallow		4548
7		A7	Ravines-Deep		951
8	Wind Erosion	B1	Sheet erosion - Slight		42
9		B2	Sheet erosion - Moderate		31982
10		B3	Sheet erosion - Severe		2
11		B4	Stablized Dunes		4669
12		B5	Partially Stablized Dunes		7470
13		B6	Un-Stablized Dunes		146
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		10832
15		C3	Subsurface waterlogged		615
16	Salinisation / Alkalisatation	D1-D3	Saline - Slight/Moderate/Severe		3642
17		D4-D6	Sodic - Slight/Moderate/Severe		25
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		585
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		
24		G2	Mining and dump areas		442
25		G3	Brick kiln		12172
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		62
28		H3	RiverineSands/Sea Ingress etc		23401

Note: White colour in map indicates either no apparent degradation or normal land.



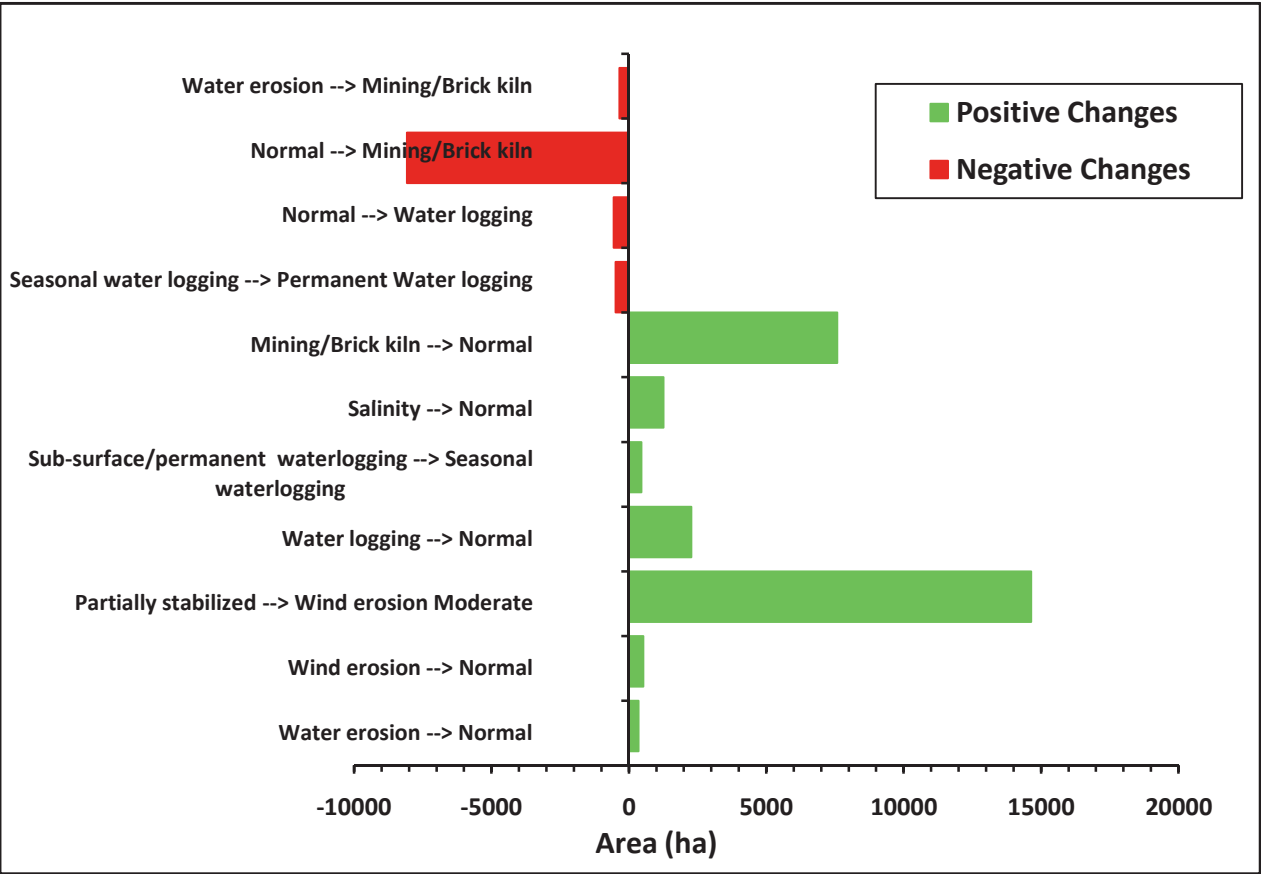
Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination Regional Remote Sensing Centre – West, CAZRI Campus, Jodhpur-342003	Partner Institution(s) Punjab Remote Sensing Centre, PAU Campus, Ludhiana – 141004,
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Table 49: Change matrix of land degradation classes in Punjab State
(during 2005-06 and 2015-16)

Area in hectares

		2015-16																											
	LD Class	A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	C1	C2	C3	D1	D4	D7	D8	G2	G3	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06	
2005-06	A1	12098													19								77			107	12301	161766	
	A2		25044																			165	65			158	25432		
	A3	241		7852																		39				20	8152		
	A4				3019																						3019		
	A5					8452																	2				8454		
	A6		101				4548																			67	4716		
	A7							951																			951		
	B1								42																	138	180		
	B2									17335														108			17443		
	B4											4669															4669		
	B5										14647		7462	146					6				244			388	22893		
	C1														8866	488				6						29	9383		
	C2														186	443		267	10	24			17				947		
	C3														275		615							150	2242	3282			
	D1																	3375					43			1265	4683		
	D4																		9								9		
	D7																				556						556		
	D8																					5					5		
	G2		2																				7				33		42
	G3																							3770			7552		11322
H2																								62			62		
H3																									23207	58	23265		
N	108	133	19							2		8		131	424							231	7846		44		8946		
Class Total (2015-16)	12447	25280	7871	3019	8452	4548	951	42	31982	2	4669	7470	146	9477	1355	615	3642	25	580	5	442	12172	62	23401	12057				
Total LD area in 2015-16	158655																												

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 12057 ha (7.45 %)
 Green Denotes Land degradation to Normal land

*Normal land to Land degradation: (+) 8946 ha (5.53 %)
 Red Denotes change from Normal land to Land degradation

*Net decrease (-) 3111 ha (1.92 %)
 Black Denotes no change in Land degradation class

Percentage is w.r.t LD of Punjab State during 2005-06
 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 50: Category - wise distribution of land degradation in different districts of Punjab State

Area in hectares

LD Class	DISTRICTS																							
	AMRITSAR		BAMALA		BATHINDA		FARIDKOT		FATEHGARH SAHIB		FAZILKA		FIROZPUR		GURDASPUR		HOSHIARPUR		JALANDHAR		KAPURTHALA		LUDHIANA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	14	14			36										121	229	4831	4732	6	6	21		227	221
A2	96	96													561	557	11399	11523	75	77				
A3																	4017	4005						
A4																	1730	1730						
A5	54	54													1194	1192	882	882						
A6																	930	930						
A7																								
B1	9	5	64	4																			82	18
B2			1176	1457	5134	10760	136	553			1584	5095	30	130					10	114	24	50	60	503
B3																								
B4			41	41	1364	1364	88	88			423	423											2	2
B5			303	15	8312	2538	599	182			5915	2269	123	23					104		26		469	29
B6																								
C1	962	962					213	200			60	170	113	96	3405	3102	1017	1068	3	6	524	547	83	79
C2	48	51		6			17	17			78	195	2	54	40	372	88	41	2	44	4	56		34
C3	556	159					52				266	13	360	279	742	11	217	20	11	6	154			
D1	72	69	19	19	186	186	42	42			2029	2036	80	80	8	8					165	157	27	27
D4						6																		
D7					26	26					302	302	16	16										
D8																								
G2		13				10					4	4				13		37	2		3	3	33	36
G3	388	696	111	319	651	937	265	458	345	251	390	909	133	351	103	647	477	655	721	535	396	231	2065	916
H2																								
H3	465	478									214	351	2075	2059	1357	1357	6425	6425	856	867	112	131	2188	2198
Total	2664	2597	1714	1861	15709	15827	1412	1540	345	251	11265	11767	2932	3088	7531	7488	32013	32048	1790	1655	1429	1175	5236	4063

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Punjab State

Area in hectares

LD Class	DISTRICTS																					
	MANSA		MOGA		MUKTSAR		NAWAN SHAHR		PATHANKOT		PATIALA		RUPNAGAR		SANGRUR		SAS NAGAR		TAM TARAN		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1					7		588	580	4608	4608	7	3	1359	1581	3		473	473			12301	12447
A2	7		30		3		8229	8235	1841	1595			1548	1462			1096	1096	547	639	25432	25280
A3									2221	2232			1886	1606			28	28			8152	7871
A4							78	78					701	701			510	510			3019	3019
A5							2919	2919	1322	1322			1363	1363			720	720			8454	8452
A6							387	359	15	15			2404	2404			314	314	666	526	4716	4548
A7									932	932			19	19							951	951
B1															25	15					180	42
B2	6480	7221	54	233	851	3467					259	313			1641	2070			4	16	17443	31982
B3		2																				2
B4	2084	2084	16	16	342	342					3	3			306	306					4669	4669
B5	1589	491	183	6	4606	1761					55				597	156			12		22893	7470
B6						146																146
C1	4	9			2127	2102	22	8	655	933	8	8	164	164	12	12			11	11	9383	9477
C2	5	5		3	594	397		14	58	55			11	11							947	1355
C3	24				315	33			538	63									47	31	3282	615
D1	45	45	26	26	639	873					375				14	14	896		60	60	4683	3642
D4	9	9				10															9	25
D7	12	12			200	224															556	580
D8					5	5															5	5
G2		7								78				205				25		11	42	442
G3	170	446	641	881	505	715	340	233	35	252	1359	520	374	511	648	580	868	548	337	581	11322	12172
H2													62	62							62	62
H3	35	35	50	50			1653	1653	1490	1490	4	4	5308	5308			4	4	1029	991	23265	23401
Total	10464	10366	1000	1215	10194	10075	14216	14079	13715	13575	2070	851	15199	15397	3246	3153	4909	3718	2713	2866	161766	158655

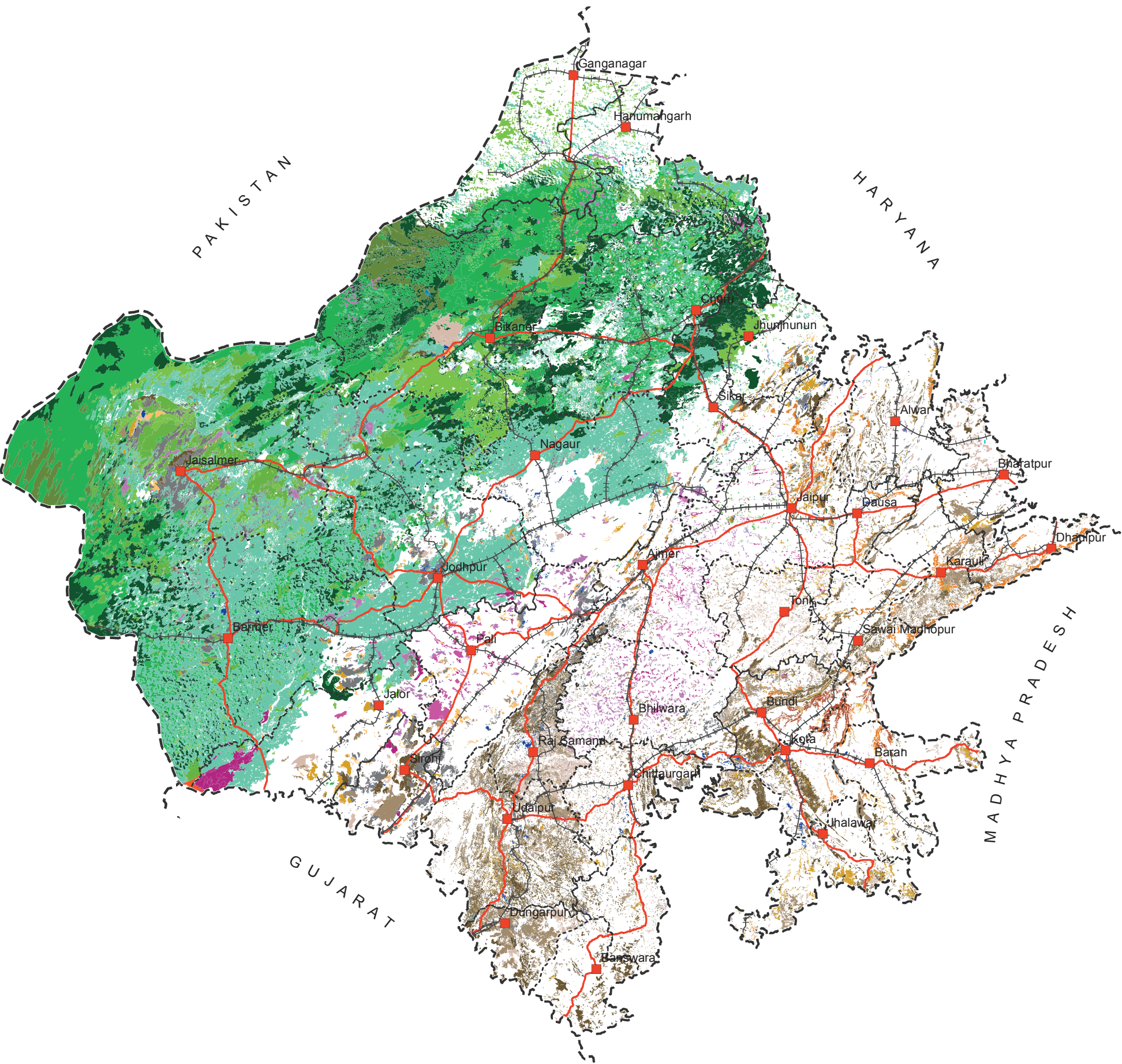
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Hoshiarpur District (32048 ha, 9.5% of district TGA)

Maximum changes in land degradation:- Patiala District (-1219 ha, 0.75% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF RAJASTHAN
2015-16



ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		312587
2		A2	Sheet erosion - Moderate		890589
3		A3	Sheet erosion - Severe		944535
4		A4	Rills		101158
5		A5	Gullies		284575
6		A6	Ravines-Shallow		153496
7		A7	Ravines-Deep		65547
8	Wind Erosion	B1	Sheet erosion - Slight		5518271
9		B2	Sheet erosion - Moderate		982436
10		B3	Sheet erosion - Severe		869625
11		B4	Stablized Dunes		2539553
12		B5	Partially Stablized Dunes		3493796
13		B6	Un-Stablized Dunes		401501
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		6974
15		C3	Subsurface waterlogged		1795
16	Salinisation / Alkalisiation	D1-D3	Saline - Slight/Moderate/Severe		315071
17		D4-D6	Sodic - Slight/Moderate/Severe		66597
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		145981
19		D10	Rann		8558
20	Acidification	E1/E2	Acidic - Moderate/Severe		
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		4955
24		G2	Mining and dump areas		84982
25		G3	Brick kiln		1718
26	Others	H1	Mass movement / mass wastage		8
27		H2	Barren rocky / Stony waste		828116
28		H3	RiverineSands/Sea Ingress etc		11642

Note: White colour in map indicates either no apparent degradation or normal land.

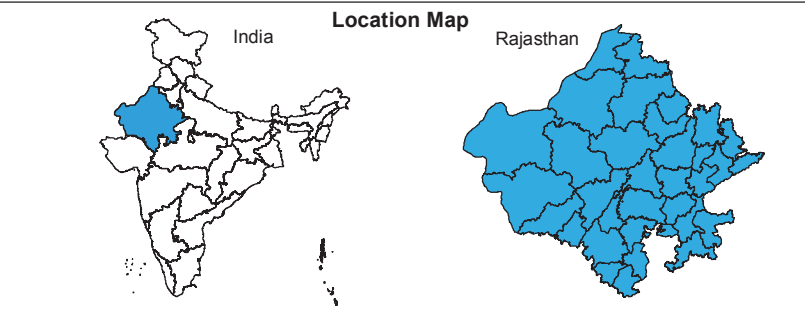
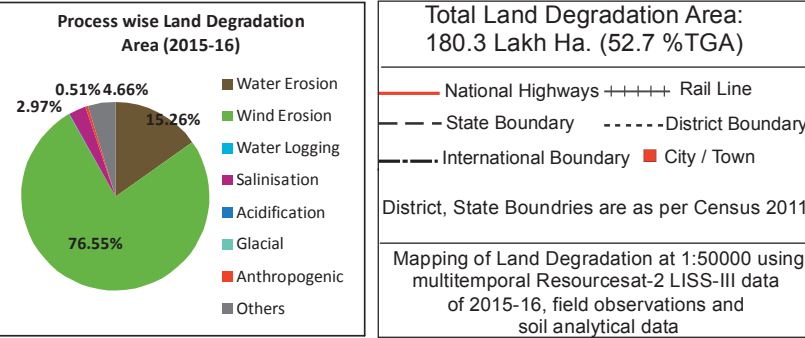


Fig. 24

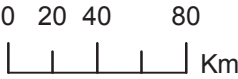
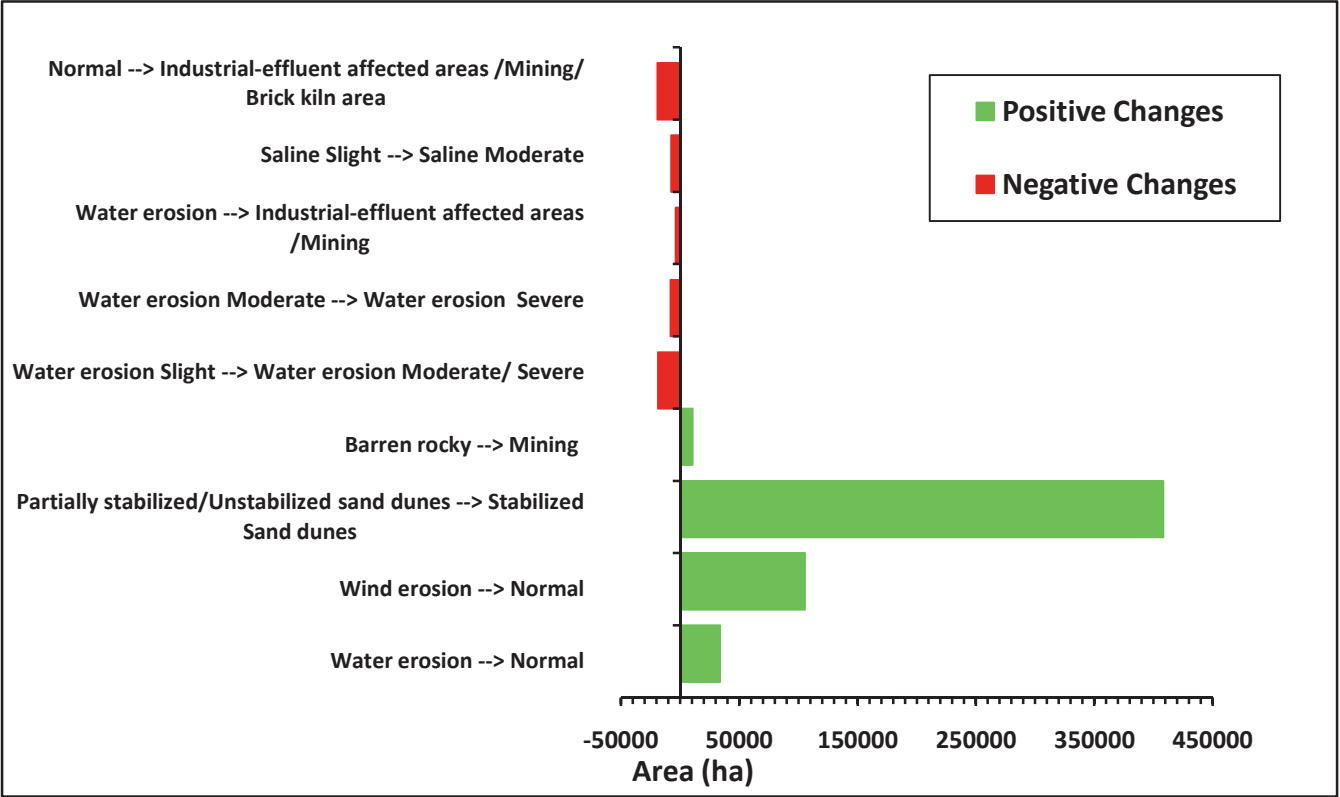


Table 51: Change matrix of land degradation classes in Rajasthan State
(during 2005-06 and 2015-16)

Area in hectares

		2015-16																																			
	LD Class	A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	C1	C2	C3	D1	D10	D2	D3	D4	D5	D6	D7	D8	D9	G1	G2	G3	H1	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06	
2005-06	A1	311417	13243	5335																								303	294					13747	344339	18151829	
	A2	430	876286	8068																								55	644					8832	894315		
	A3	358	262	930234																								12	1303					11272	943441		
	A4				101158																								989						102147		
	A5			345		284575																							154						285074		
	A6						153496																						9						153505		
	A7							65547																											65547		
	B1								5517481																									267	5517748		
	B2									982284	26																			308					13924		996542
	B3										869599																			4					3894		873497
	B4								790	119		2131235																		39					8306		2140489
	B5									33		386086	3492803	20																11					77624		3956577
	B6											22232	954	401481																					1429		426096
	C1															3971																					3971
	C2																3003																				3003
	C3																	1795																			1795
	D1																		221178		7485									179							228842
	D10																			8558																	8558
	D2																				45294	14								149					11		45468
	D3																					41074				7									10		41091
	D4																						50507	121											18		50646
	D5																						4284						146								4430
	D6																							11016													11016
	D7																								80673	464											81137
	D8																									41511									33		41544
	D9																										23333										23333
	G1																											4095									4095
	G2																												51730						21		51751
	G3																														1584						1584
	H1																															8					8
	H2																												10464			828116					838580
	H3																						6										11642	12			11660
	N	382	798	553										39							17	9			656				490	18559	134						21637
	Class Total (2015-16)	312587	890589	944535	101158	284575	153496	65547	5518271	982436	869625	2539553	3493796	401501	3971	3003	1795	221178	8558	52796	41097	50513	4405	11679	80673	41975	23333	4955	84982	1718	8	828116	11642	139400			
	Total LD area in 2015-16	18034066																																			

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 139400ha (0.77%)
*Normal land to Land degradation: (+) 21637 ha (0.12 %)
*Net decrease (-): 117763 ha (0.65 %)
Percentage is w.r.t LD of Rajasthan State during 2005-06

Green Denotes Land degradation to Normal land
Red Denotes change from Normal land to Land degradation
Black Denotes no change in Land degradation class
Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 52: Category - wise distribution of land degradation in different districts of Rajasthan State

Area in hectares

	DISTRICTS																								
LD Class	AJMER		ALWAR		BANSWARA		BARAN		BARMER		BHARATPUR		BHILWARA		BIKANER		BUNDI		CHITTAURGARH		CHURU		DAUSA		
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	
A1	5856	5736	4420	4101	3585	2221	17998	11232	11	11	31128	30679	4480	3974	43417	43417	9355	8712	14989	14563	117	117	321	108	
A2	26906	27324	19291	19166	18878	19031	18262	20355	473	473	34999	35448	33391	33698	5086	4903	41119	39407	46906	46383	239	213	10981	10404	
A3	17350	17389	44705	44953	44652	45670	33400	33332	1073	1073	11890	11890	9101	9383	2353	2353	77881	76751	84148	83187			8405	9035	
A4									7188	7183							5028	4783					319	261	
A5	3961	3961	11407	11407	885	885	13250	13250	9533	9533	9372	9372	348	348	1758	1758	12085	12085	11138	11138	70	70	4245	4245	
A6	4517	4517	9369	9369			8729	8729	63	63	71	71					5513	5513					10954	10954	
A7							4262	4262									29730	29730							
B1	38	38							1530773	1530773							183881	184181					364905	364905	
B2	363	363							38238	38238							398522	386292					18512	17128	
B3	28	28							81627	81627							83558	83558					39315	37119	
B4	60	60							366030	375556							455549	617398					428111	450551	
B5	838	858							464700	455359	4	4					1150045	1000506					534824	433963	
B6	8	8							1606	1419							252613	234409					7361	5868	
C1									297	297	361	361													
C2																	3	3							
C3																	1753	1753							
D1	13715	13580	376	376			1241	1232	9451	9451	560	560	63764	56646	23043	23043	46	46	33	33	3770	3708	253	248	
D10									4406	4406															
D2	4322	4454							3843	3843	42	42	4741	11859	889	889	11	11					835	756	5
D3	2709	2725							10949	10949	52	52	158	158	437	437							250	250	
D4	853	853							578	578	21	21	3655	3534			25	25					4296	4296	
D5	927	927							311	311					121									55	55
D6	1257	1920																							
D7	6518	6313	72	72					1098	1098	507	507	5051	4792			793	793	83	83	9145	9145	434	434	
D8	5600	5795	535	535					5466	5466	141	141	2465	2724					25	25					
D9	2934	2934											902	902											
G1	771	950	905	905				168	227	227									173	173	68	68			
G2	1165	2107	473	616	301	641	463	504	3090	6028	254	254	3720	5021	3147	4231	2858	3369	2371	3593	178	910	582	703	
G3											1	1					54	54					6	6	
H1																									
H2	19643	19643	21419	21376	2534	2269	3884	3884	87044	86761	2548	2548	29267	29078	1831	1716	6813	6665	7493	7468	308	290	1356	1356	
H3	388	388	1580	1580			169	169	177	177	483	483	78	78									261	261	
Total	120727	122871	114552	114456	70835	70717	101658	97117	2628252	2630900	92434	92434	161121	162316	2612967	2595684	186229	183107	167359	166646	1412629	1329624	37847	37808	

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Category - wise distribution of land degradation in different districts of Rajasthan State

Area in hectares

LD Class	DISTRICTS																							
	DHAULPUR		DUNGARPUR		GANGANAGAR		HANUMANGARH		JAIPUR		JAISALMER		JALOR		JHALAWAR		JHUNJHUNUN		JODHPUR		KARAULI		KOTA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	4097	4107	17580	16621					5532	2914	7093	7093	11158	11158	10145	6412	379	379	6447	6447	4890	3278	11236	7841
A2	15991	15991	111319	111483					22063	23703	5813	5813	8087	8087	41018	41070	349	346	4372	4372	62302	61949	12787	12636
A3	8181	8184	42277	41947					42888	42639	18873	18873	7094	7094	34290	37543	12406	12406			21914	23439	45908	45154
A4											11440	11440	7334	7330			3280	3280	12094	12025				
A5	2726	2726	143	143					28020	28020	4392	4392	26854	26854	41748	41748	9278	9268	5183	5183	5901	5901	13060	13060
A6	26758	26758							22353	22353					727	727	1821	1821			26829	26829	11201	11201
A7	82	82																			1720	1720	29396	29396
B1					72204	72204	179337	179070	261	261	918198	918230	194535	194535			18385	18385	1265545	1265816				
B2					142788	142788	62412	62275	7102	6898	184362	184362	9599	9718			65948	65855	37527	37487				
B3					4679	4128	81639	80492	239	265	511157	511157	3852	3852			1455	1451	64761	64761				
B4					42364	44002	127871	128279	1326	1326	403837	439339	11194	11403			58253	106212	118653	164118				
B5					162670	161032	98137	95829	1275	1267	1200002	1168166	4901	4570			47818	407	200512	154810				
B6					2722	2722			52	52	158824	155126					548		1835	1801				
C1					1129	1129	1080	1080			433	433	371	371										
C2	8	8					660	660			2332	2332												
C3																								
D1					9370	9370	14147	14147	8505	8505	4543	4543	11346	11346			475	475	9452	9452	119	119	146	146
D10													4152	4152										
D2							3837	3837	2294	2289	9617	9617	1803	1803			73	73	5627	5627				
D3									1462	1452	9603	9603	2254	2254					4089	4089				
D4									338	326			1261	1261			177	177	2109	2109				
D5	2	2							200	200			2789	2789										
D6									489	489														
D7							360	360	1788	1788			30957	30957			244	244	6259	6259	17	17	30	30
D8									4419	4396			22218	22218										
D9									1428	1428			17116	17116			43	43						
G1									35	49			710	710	57	436	154	154						12
G2	56	56	508	581					1276	1855	3938	4386	44	591	1243	2189	206	1210	5087	9916	168	210	4611	4777
G3	4	4			736	736	101	101	622	622			5	5			31	31						134
H1	8	8																						
H2	2167	2167	7415	7377					7014	6963	222304	222018	23741	23447	1104	971	11158	10827	100624	96790	7441	7441	772	772
H3	15	15							4389	4371			339	339			1271	1271			25	25		
Total	60095	60108	179242	178152	438662	438111	569581	566130	165370	164431	3676761	3676923	403714	403960	130332	131096	233752	234315	1850176	1851062	131326	130928	129147	125159

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Category - wise distribution of land degradation in different districts of Rajasthan State

Area in hectares

LD Class	DISTRICTS																			
	NAGAU		PALI		PRATAPGARH		RAJ SAMAND		SAWAI MADHOPUR		SIKAR		SIROHI		TONK		UDAIPUR		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	7525	7525	1603	1603	2799	2222	41304	40858	3775	3032	1459	1459	18289	18289	43668	36928	9683	9550	344339	312587
A2	524	524	8924	8880	14983	14667	59144	58771	21448	21034	2059	2059	42851	42851	29379	28795	174371	170753	894315	890589
A3	81	81	388	388	22889	20506	78020	77460	36667	36786	20076	20076	50320	50648	19731	19350	146480	146945	943441	944535
A4	10659	10659	32093	31544							5505	5472	7207	7181					102147	101158
A5	6428	6428	2922	2922	3031	3031	309	309	7856	7856	18264	18127	6748	6396	8807	8807	15352	15352	285074	284575
A6									13871	13871	10569	10560			160	160			153505	153496
A7									357	357									65547	65547
B1	716863	716863	49	49							72758	72945			16	16			5517748	5518271
B2	22342	22205	10	10							8692	8692	125	125					996542	982436
B3	548	548	517	517							104	104	18	18					873497	869625
B4	64947	77776	63	63							62231	123470							2140489	2539553
B5	22785	9956	48	48							68018	7021							3956577	3493796
B6									96	96	431								426096	401501
C1	114	114			54	54											132	132	3971	3971
C2																			3003	3003
C3													42	42					1795	1795
D1	10103	9995	37580	37580	345	345	926	707	14	14	1509	1509	3544	3544	466	458			228842	221178
D10																			8558	8558
D2	2590	2520	4078	4078				219			321	321	351	351	194	202			45468	52796
D3	8602	8602									526	526							41091	41097
D4	93	93	37033	37033							186	186			21	21			50646	50513
D5	146																		4430	4405
D6			9270	9270															11016	11679
D7			8838	8838	122	122			153	153	1226	1226	5897	5897	1545	1545			81137	80673
D8											95	95			42	42	538	538	41544	41975
D9											910	910							23333	23333
G1			334	334			29	137			128	128	504	504					4095	4955
G2	4299	9347	853	5578	373	448	6586	7634	118	142	74	2068	949	1701	271	271	2489	4045	51751	84982
G3			2	2							22	22							1584	1718
H1																			8	8
H2	44820	42082	71656	70635	2636	2636	33412	33284	2533	2531	16139	16076	78014	77692	2210	2210	19280	19143	838580	828116
H3	234	234	100	100	7	7			524	524	1456	1456	5	5	159	159			11660	11642
Total	923703	925552	216361	219472	47239	44038	219730	219379	87412	86396	292758	294508	214864	215244	106669	98964	368325	366458	18151829	18034066

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Jaisalmer District (3676923 ha, 95.8 % of district TGA) Maximum changes in land degradation:- Churu District (-83005 ha, 0.46% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF SIKKIM
2015-16

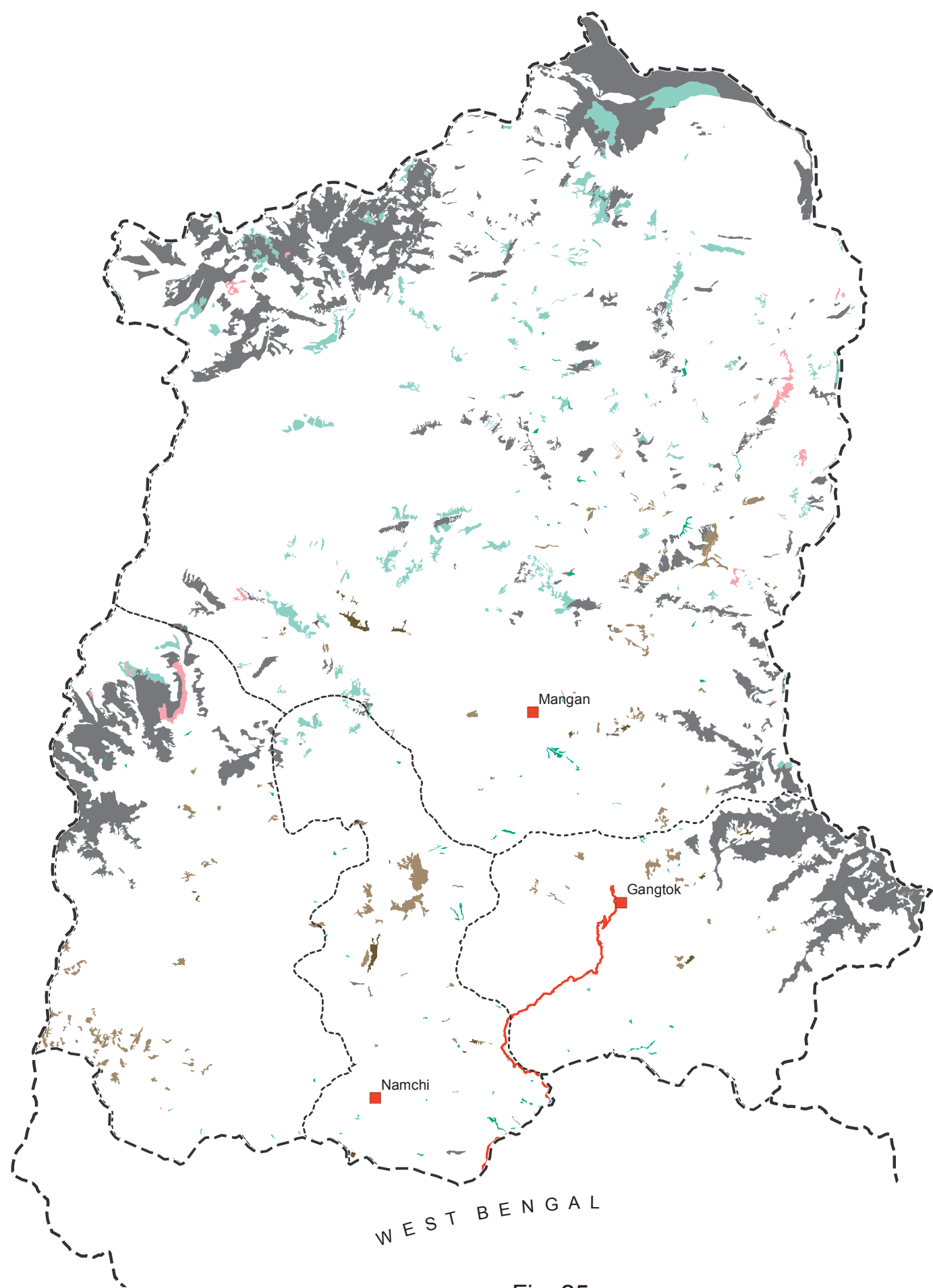
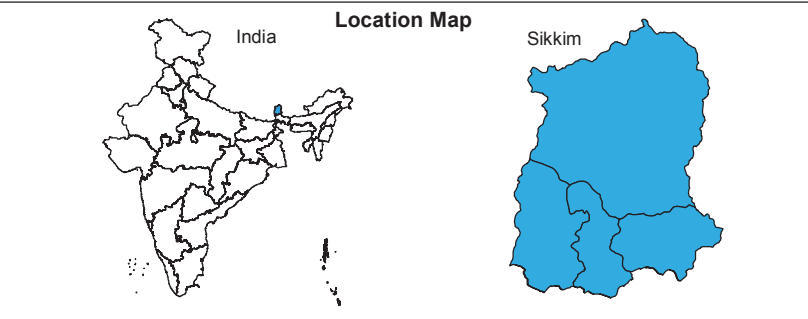
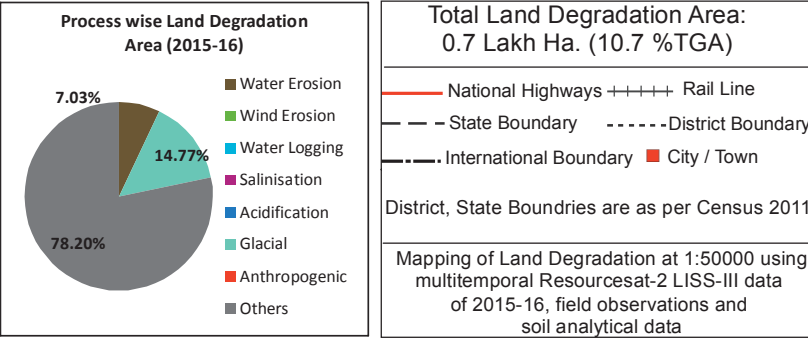


Fig. 25

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		86
2		A2	Sheet erosion - Moderate		4538
3		A3	Sheet erosion - Severe		738
4		A4	Rills		
5		A5	Gullies		
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		
21	Glacial	F1	Frost heaving		1212
22		F2	Frost Shattering		10059
23	Anthropogenic	G1	Industrial effluent affected areas		
24		G2	Mining and dump areas		
25		G3	Brick kiln		
26	Others	H1	Mass movement / mass wastage		744
27		H2	Barren rocky / Stony waste		58884
28		H3	RiverineSands/Sea Ingress etc		29

Note: White colour in map indicates either no apparent degradation or normal land.



Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination North Eastern Space Application Centre (NESAC),Umiam-793103 (Meghalaya)	Partner Institution(s) National Remote Sensing Centre, Balanagar, Hyderabad-500037
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**Table 53: Change matrix of land degradation classes in Sikkim State
(during 2005-06 and 2015-16)**

Area in hectares												
		2015-16										
	LD Class	A1	A2	A3	F1	F2	H1	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06
2005-06	A1	83									83	76300
	A2	3	4538								4541	
	A3			738							738	
	F1				1212						1212	
	F2					10059					10059	
	H1						744			10	754	
	H2							58884			58884	
	H3								29		29	
	Class Total (2015-16)	86	4538	738	1212	10059	744	58884	29	10		
	Total LD area in 2015-16	76290										

•Land degradation to Normal land : (-) 10 ha (0.01%)
 •Normal land to Land degradation: (+) 0 ha
 •Net decrease: (-) 10 ha (0.01%)
 # Percentage is w.r.t LD of Sikkim State during 2005-06

Green Denotes Land degradation to Normal land
 Red Denotes change from Normal land to Land degradation
 Black Denotes no change in Land degradation class
 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 54: Category - wise distribution of land degradation in different districts of Sikkim State

Area in hectares

LD Class	DISTRICTS									
	EAST		NORTH		SOUTH		WEST		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1			83	83				3	83	86
A2	494	494	1427	1427	1245	1245	1375	1372	4541	4538
A3	100	100	380	380	223	223	35	35	738	738
F1			702	702			510	510	1212	1212
F2			9271	9271	360	360	428	428	10059	10059
H1	94	94	399	399	195	185	66	66	754	744
H2	10424	10424	37639	37639	293	293	10528	10528	58884	58884
H3					29	29			29	29
Total	11112	11112	49901	49901	2345	2335	12942	12942	76300	76290

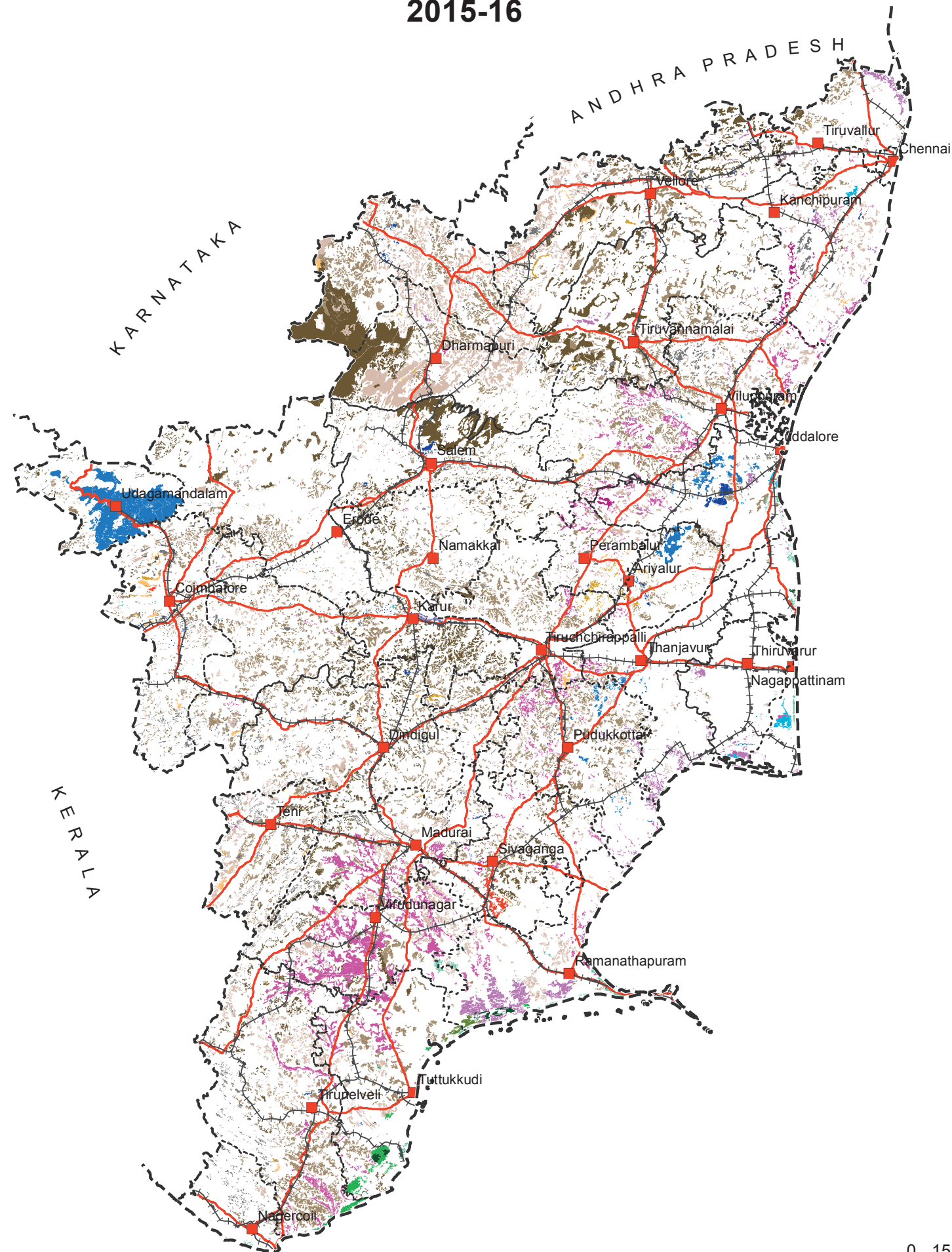
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in North District (49901 ha, 11.8% of district TGA)

Maximum changes in land degradation:-South District (-10 ha, 0.01% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF TAMIL NADU
2015-16



ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		439754
2		A2	Sheet erosion - Moderate		774152
3		A3	Sheet erosion - Severe		521463
4		A4	Rills		16383
5		A5	Gullies		14141
6		A6	Ravines-Shallow		385
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		18219
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		6398
12		B5	Partially Stablized Dunes		16584
13		B6	Un-Stablized Dunes		4181
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		10540
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisatation	D1-D3	Saline - Slight/Moderate/Severe		81964
17		D4-D6	Sodic - Slight/Moderate/Severe		251452
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		13052
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		124141
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		2219
24		G2	Mining and dump areas		19971
25		G3	Brick kiln		6305
26	Others	H1	Mass movement / mass wastage		
27		H2	Barren rocky / Stony waste		112578
28		H3	RiverineSands/Sea Ingress etc		6659

Note: White colour in map indicates either no apparent degradation or normal land.

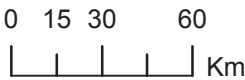
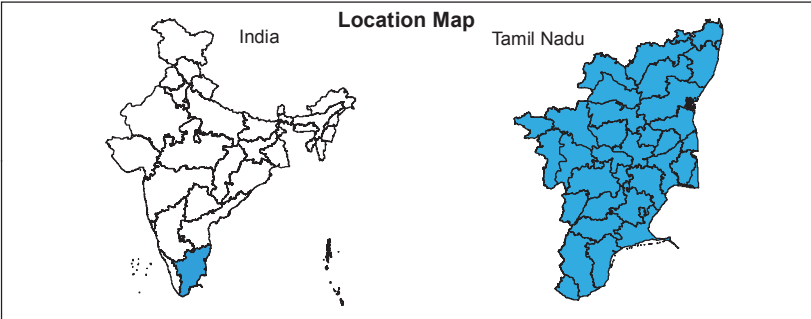
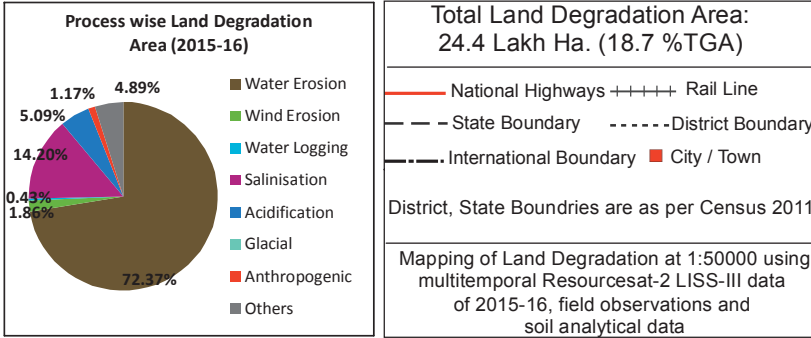
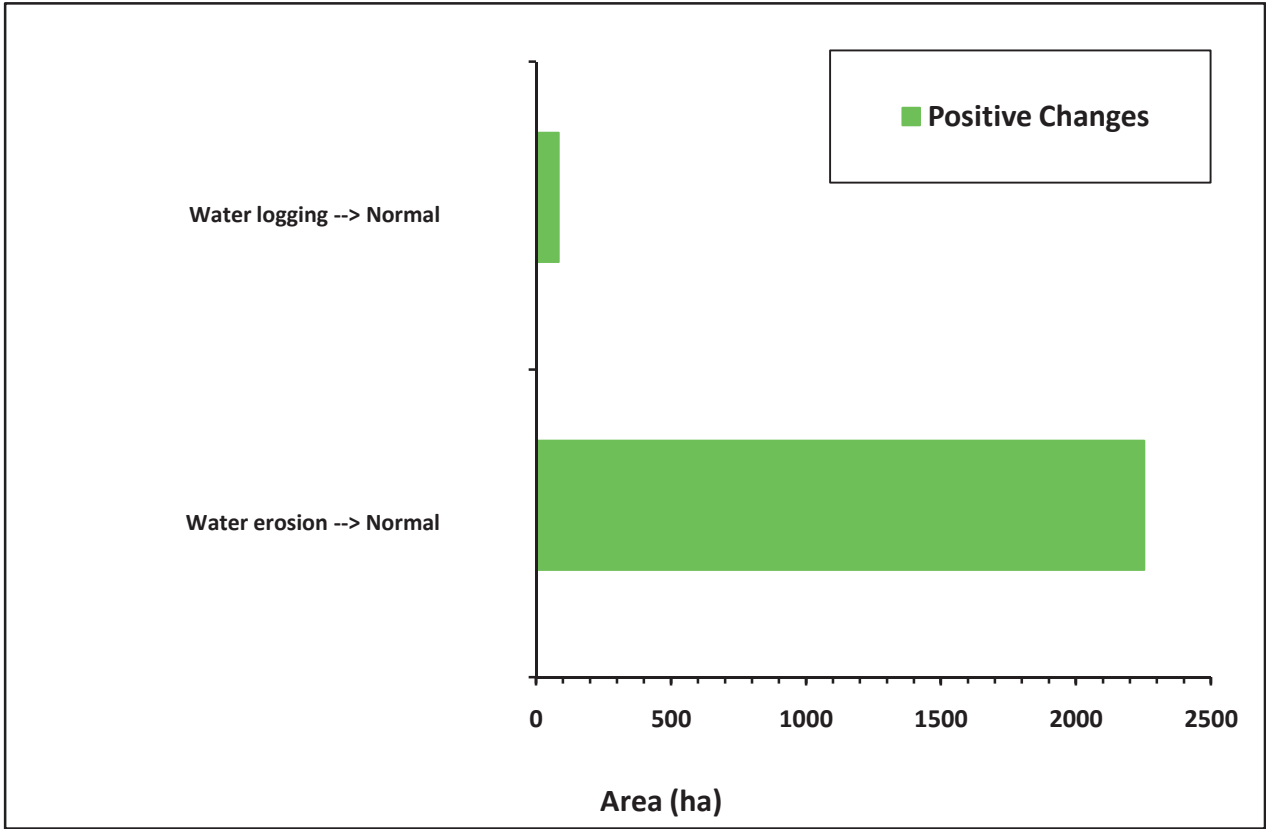


Table 55: Change matrix of land degradation classes in Tamil Nadu State
(during 2005-06 and 2015-16)

Area in hectares

		2015-16																												Class Total (2005-06)	Total LD area in 2005-06
	LD Class	A1	A2	A3	A4	A5	A6	B1	B4	B5	B6	C1	C2	D1	D2	D4	D5	D6	D7	D8	D9	E1	E2	G1	G2	G3	H2	H3	N		
2005-06	A1	439754																											349	440103	2442795
	A2		774152																										1729	775881	
	A3			521463																									80	521543	
	A4				16383																									16383	
	A5					14141																								14141	
	A6						385																							385	
	B1							18219																						18219	
	B4								6389																					6389	
	B5								9	16584																				16593	
	B6										4181																			4181	
	C1											3330																	25	3355	
	C2												28	7182															59	7269	
	D1														40076														1	40077	
	D2															41888													11	41899	
	D4																158440													158440	
	D5																	86521												86521	
	D6																		6491											6491	
	D7																			937										937	
	D8																				11858									11858	
	D9																					257								257	
	E1																						89182							89182	
	E2																							34959						34959	
	G1																								2219					2219	
G2																									19960				19960		
G3																										6305			6305		
H2																											11	112578	112589		
H3																												6659	6659		
	Class Total (2015-16)	439754	774152	521463	16383	14141	385	18219	6398	16584	4181	3358	7182	40076	41888	158440	86521	6491	937	11858	257	89182	34959	2219	19971	6305	112578	6659	2254		
	Total LD area in 2015-16	2440541																													

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 2254 ha (0.09 %)
 Green Denotes Land degradation to Normal land

*Normal land to Land degradation: (+) 0 ha (0%)
 Red Denotes change from Normal land to Land degradation

*Net decrease (-) 2254 ha (0.09 %)
 Black Denotes no change in Land degradation class

Percentage is w.r.t LD of Tamil Nadu State during 2005-06
 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 56: Category - wise distribution of land degradation in different districts of Tamil Nadu State

Area in hectares

LD Class	DISTRICTS																							
	ARIYALUR		CHENNAI		COIMBATORE		CUDDALORE		DHARMAPURI		DINDIGUL		ERODE		KANCHIPURAM		KANNIYAKUMARI		KARUR		KRISHNAGIRI		MADURAI	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	575	575	20	20	6665	6665	6797	6797	92366	92366	13535	13502	7437	7437	16758	16758	2032	2032	995	995	58996	58996	18031	17978
A2	14818	13690			30526	30428	12273	12273	22155	22155	30324	30324	24507	24507	7498	7498	1116	1090	21258	21258	62286	62286	21317	21317
A3					3252	3252			65361	65361	33550	33550	20010	20010	1604	1604	1329	1329	41141	41141	70336	70336	12635	12635
A4					4171	4171			477	477	1303	1303	181	181	574	574			130	130	1313	1313	301	301
A5	2156	2156			1251	1251	39	39	367	367	115	115							893	893	230	230		
A6	2	2																						
B1							1330	1330							21	21	496	496						
B4																		9						
B5							252	252									195	186						
B6																								
C1					340	326	2260	2260			9	26			176	176								
C2					56	9					45	5			1498	1498			128	128				
D1	135	135					3213	3212	908	908	18	18			4325	4325								
D2															2550	2550								
D4	704	704			45	45	5483	5483	788	788	66	66	24	24	1999	1999	36	36	105	105	65	65	2961	2961
D5	54	54			13	13	223	223	51	51	18	18	71	71	1471	1471			12	12			23817	23817
D6							57	57	25	25					19	19					38	38		
D7							144	144							249	249								
D8							2503	2503							6600	6600								
D9																								
E1	8984	8984			17	17	9864	9864																
E2					546	546	1394	1394					6	6										
G1																			2213	2213				
G2	1708	1708			791	791	6001	6001			855	855	317	317	381	381	11	11	919	919	1758	1758	549	549
G3					535	535							29	29			5	5						
H2					8222	8222	1155	1155	1274	1274	10995	10995	2120	2120	6622	6622	4925	4925	1153	1153	4093	4093	6298	6298
H3							646	646							2051	2051								
Total	29136	28008	20	20	56430	56271	53634	53633	183772	183772	90833	90777	54702	54702	54396	54396	10145	10119	68947	68947	199115	199115	85909	85856

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Tamil Nadu State

Area in hectares

LD Class	DISTRICTS																							
	NAGAPPATTINAM		NAMAKKAL		NILGIRI		PERAMBALUR		PUDUKKOTTAI		RAMANATHAPURAM		SALEM		SIVAGANGA		TENI		THANJAVUR		THIRUVARUR		TIRUCHCHIRAPPALLI	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	365	365	2191	2191	757	757	4319	4319	6969	6937	16927	16833	5529	5529	5389	5336	16037	16037	2758	2729			3822	3822
A2	25	25	24468	24451	4029	4018	7350	7350	51906	51822	1440	1432	15871	15853	19385	19382	17737	17714	6566	6501			52754	52688
A3			13662	13662	3784	3784	1373	1373	4419	4419	531	531	59392	59368	15954	15954	10301	10301	128	128			1637	1637
A4							356	356	239	239							2371	2371					1800	1800
A5							2646	2646	1	1			80	80			187	187					2788	2788
A6							122	122							261	261								
B1	3047	3047							321	321	8872	8872												
B4	513	513									3163	3163							256	256				
B5	145	145									955	955							77	77				
B6											2563	2563												
C1	94	94																						
C2	4188	4188																			692	692		
D1	983	983					115	115	4838	4838	702	702							8953	8953	3066	3066	800	800
D2											31311	31300												
D4	423	423	106	106			5889	5889	7906	7906	5835	5835	895	895	733	733			2335	2335	20	20	6005	6005
D5	533	533	20	20			380	380	2544	2544	4858	4858	204	204	4008	4008	206	206	465	465			447	447
D6			23	23					4245	4245					78	78							86	86
D7	5	5																						
D8															898	898								
D9															161	161							96	96
E1					61578	61578			5615	5615	128	128							2450	2450				
E2					32486	32486																		
G1																								
G2			354	354			279	279	660	660			2042	2042	24	24	111	111					243	254
G3											5	5			5711	5711								
H2			4786	4786	2116	2116	1224	1224	502	502			5081	5081	272	272	9728	9728					2652	2641
H3	1401	1401							22	22	475	475			243	243					30	30		
Total	11722	11722	45610	45593	104750	104739	24053	24053	90187	90071	77765	77652	89094	89052	53117	53061	56678	56655	23988	23894	3808	3808	73130	73064

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Tamil Nadu State

Area in hectares

LD Class	DISTRICTS																			
	TIRUNELVELI		TIRUPPUR		TIRUVALLUR		TIRUVANNAMALAI		TIRUVARUR		TUTICORIN (TUTTUKUDI)		VELLORE		VILLUPURAM		VIRUDUNAGAR		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	25566	25566	7100	7100	5330	5330	2286	2286	753	740	17332	17332	42269	42269	22423	22381	27774	27774	440103	439754
A2	58392	58374	57370	57269	14819	14819	49381	49318	800	800	29162	29162	34411	34411	66366	66366	15571	15571	775881	774152
A3	14851	14851	3970	3970	18104	18104	61506	61506			3196	3140	45866	45866	3488	3488	10163	10163	521543	521463
A4	573	573	712	712							406	406	1476	1476					16383	16383
A5	358	358			146	146	267	267					1821	1821	759	759	37	37	14141	14141
A6																			385	385
B1	229	229			379	379			17	17	2540	2540					967	967	18219	18219
B4											2457	2457							6389	6398
B5	4135	4135									10834	10834							16593	16584
B6											1618	1618							4181	4181
C1			176	176					86	86					214	214			3355	3358
C2			14	14					648	648									7269	7182
D1			316	316	1818	1818	2196	2196	4614	4614			1172	1172	1905	1905			40077	40076
D2					7502	7502									536	536			41899	41888
D4	23379	23379	817	817	326	326	1201	1201	681	681	8660	8660	183	183	20234	20234	60536	60536	158440	158440
D5	5579	5579	267	267	277	277	394	394			11991	11991	455	455	8630	8630	19533	19533	86521	86521
D6	10	10			7	7	21	21							1882	1882			6491	6491
D7															482	482	57	57	937	937
D8															1857	1857			11858	11858
D9																			257	257
E1									357	357					189	189			89182	89182
E2															527	527			34959	34959
G1															6	6			2219	2219
G2	614	614	550	550	256	256	83	83			193	193	643	643	385	385	233	233	19960	19971
G3											13	13					7	7	6305	6305
H2	7386	7386	5023	5023	782	782	7646	7646			425	425	7881	7881	7870	7870	2358	2358	112589	112578
H3					46	46					137	137	51	51	1557	1557			6659	6659
Total	141072	141054	76315	76214	49792	49792	124981	124918	7956	7943	88964	88908	136228	136228	139310	139268	137236	137236	2442795	2440541

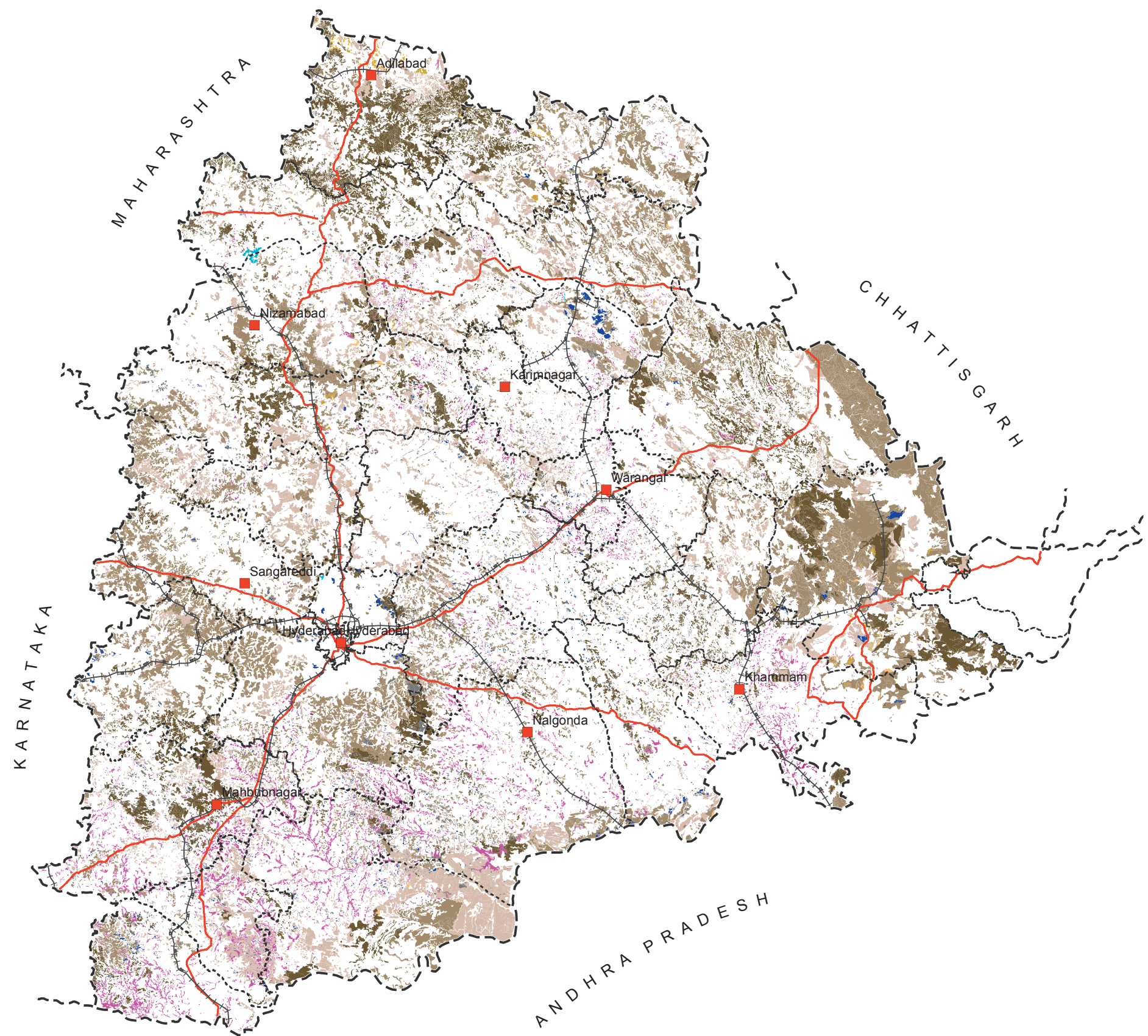
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Krishnagiri District (199115 ha, 39% of district TGA)

Maximum changes in land degradation:-Ariyalur District (-1128 ha, 0.05% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF TELANGANA
2015-16



ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		757721
2		A2	Sheet erosion - Moderate		1385826
3		A3	Sheet erosion - Severe		715512
4		A4	Rills		4524
5		A5	Gullies		15517
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		2457
15		C3	Subsurface waterlogged		42
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		1502
17		D4-D6	Sodic - Slight/Moderate/Severe		214687
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		14450
19		D10	Rann		
20	Acidification	E1/E2	Acidic - Moderate/Severe		249
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		500
24		G2	Mining and dump areas		48280
25		G3	Brick kiln		75
26	Others	H1	Mass movement / mass wastage		13
27		H2	Barren rocky / Stony waste		71936
28		H3	RiverineSands/Sea Ingress etc		130

Note: White colour in map indicates either no apparent degradation or normal land.

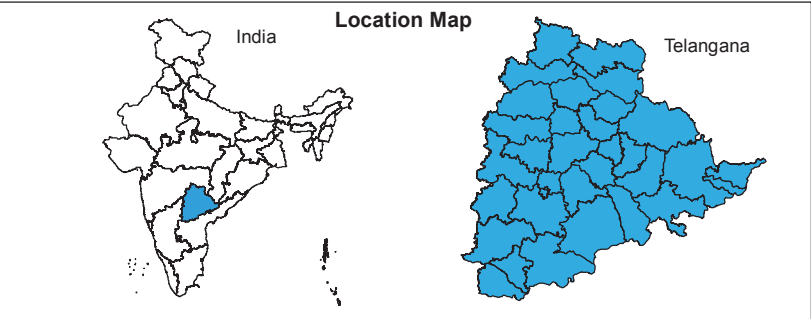
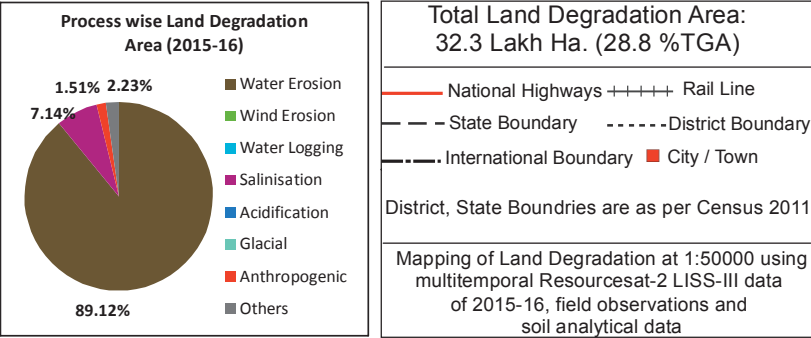
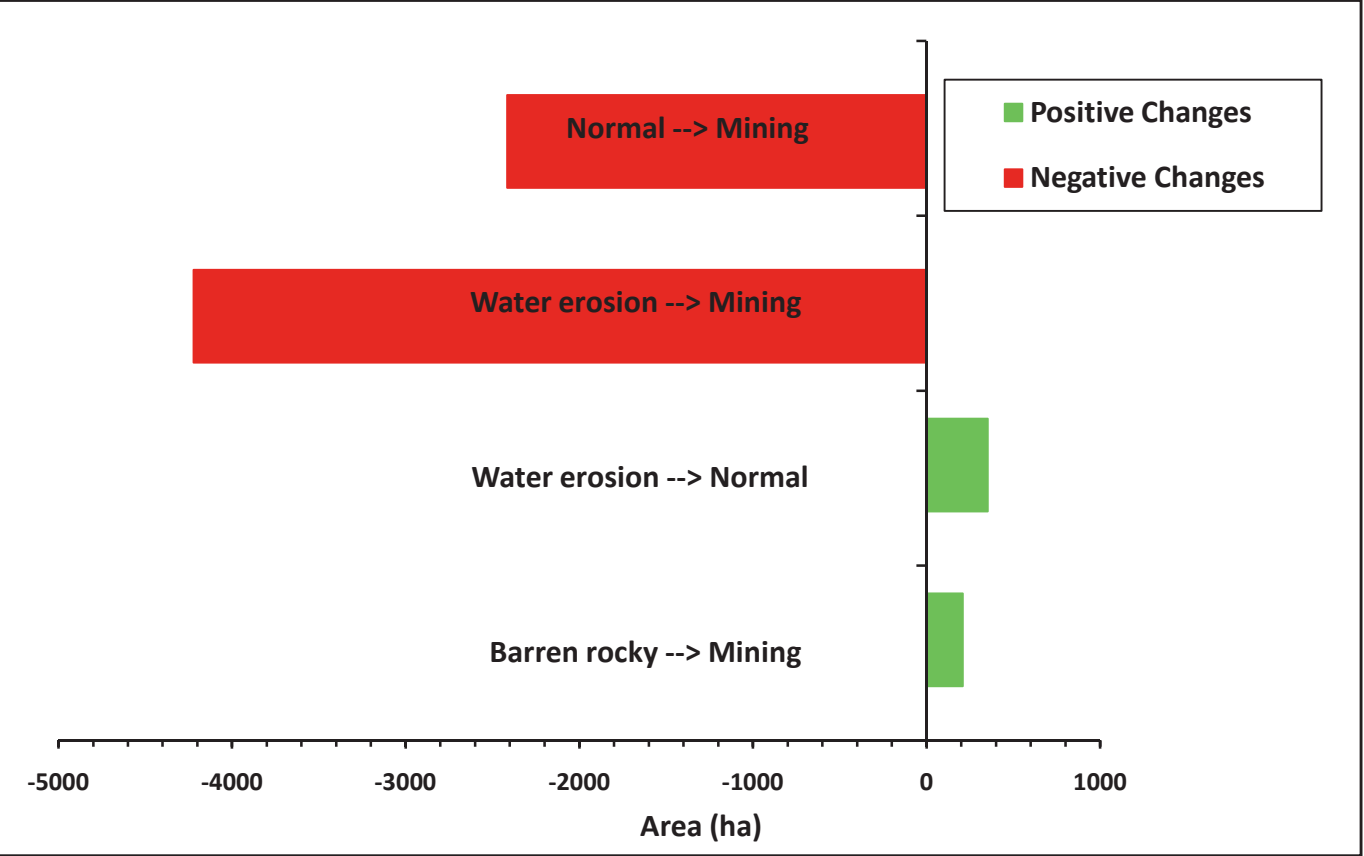


Table 57: Change matrix of land degradation classes in Telangana State
(during 2005-06 and 2015-16)

		2015-16																								Area in hectares	
	LD Class	A1	A2	A3	A4	A5	C1	C3	D1	D2	D4	D5	D6	D7	D8	D9	E1	G1	G2	G3	H1	H2	H3	N	Class Total (2005-06)	Total LD area in 2005-06	
2005-06	A1	757721																	1492					28	759241	3231345	
	A2		1385778																2532						1388310		
	A3			715512															198					282	715992		
	A4				4524																				4524		
	A5					15517																		43	15560		
	C1						2457																		2457		
	C3							42																	42		
	D1								1077																1077		
	D2									425															425		
	D4										127102								19					34	127155		
	D5											67751													67751		
	D6												19834												19834		
	D7													8735											8735		
	D8														4361										4361		
	D9															1354									1354		
	E1																249								249		
	G1																	500							500		
	G2																		41414						41414		
	G3																			75					75		
	H1																				13				13		
	H2																			210			71936		72146		
H3																						130		130			
N			48																2415						2463		
	Class Total (2015-16)	757721	1385826	715512	4524	15517	2457	42	1077	425	127102	67751	19834	8735	4361	1354	249	500	48280	75	13	71936	130	387			
	Total LD area in 2015-16	3233421																									

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 387ha (0.01%)
 Green Denotes Land degradation to Normal land

*Normal land to Land degradation: (+) 2463 ha (0.08 %)
 Red Denotes change from Normal land to Land degradation

*Net increase (+): 2076 ha (0.06 %)
 Black Denotes no change in Land degradation class

Percentage is w.r.t LD of Telangana State during 2005-06
 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 58: Category - wise distribution of land degradation in different districts of Telangana State

Area in hectares

LD Class	DISTRICTS																					
	ADILABAD		BHADRADRI KOTHAGUDEM		HYDERABAD		JAGITYAL		JANGAON		JAYASHANKAR		JOGULAMBA GADWAL		KAMAREDDY		KARIMNAGAR		KHAMMAM		KOMARAM BHEEM	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	22673	22653	42028	41862			29592	29592	10989	10973	28881	28848	3939	3931	27908	27891	9492	9465	13206	13206	24358	24358
A2	11747	11791	228451	228108	191	191	15856	15856	3254	3254	169485	169199	15035	14910	45711	45706	6134	6134	26916	26848	79426	79430
A3	122694	122430	102027	102027			19997	19997	5338	5338	56356	56356	12465	12465	33733	33733	5256	5256	12417	12417	38130	38093
A4	444	444	1340	1340			42	42			183	183							381	381	226	226
A5	5159	5116	3770	3770			447	447	54	54	109	109			1073	1073	38	38	1025	1025	1831	1831
C1											30	30					14	14				
C3							19	19									5	5				
D1							33	33	30	30	130	130							40	40		
D2							106	106					57	57			13	13				
D4	307	307	337	303			1866	1866	2472	2472	2284	2284	12496	12496	788	788	1349	1349	18188	18188	1269	1269
D5	20	20					228	228	1169	1169	329	329	7193	7193	421	421	571	571	672	672	126	126
D6							100	100	614	614	62	62	2669	2669			34	34	51	51		
D7			28	28			1013	1013			134	134			24	24	614	614	1985	1985		
D8			53	53			1252	1252	250	250	27	27	111	111			199	199	299	299		
D9							75	75	114	114							2	2	607	607		
E1																						
G1			489	489									3	3								
G2	42	52	2871	3491			391	391	2283	2316	27	468	1554	1700	1077	1127	669	696	1379	1625	349	739
G3			22	22																	9	9
H1											13	13										
H2	1145	1145	851	851	13	13	718	718	1912	1912	1382	1382	1592	1592	2481	2453	934	934	1041	1041	45	45
H3			23	23							82	82										
Total	164231	163958	382290	382367	204	204	71735	71735	28479	28496	259514	259636	57114	57127	113216	113216	25324	25324	78207	78385	145769	146126

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Telangana State

Area in hectares

LD Class	DISTRICTS																					
	MACHERIAL		MAHABUBABAD		MAHBUBNAGAR		MEDAK		MEDCHAL		NAGARKURNOOL		NALGONDA		NIRMAL		NIZAMABAD		PEDDAPALLE		RAJANNA SIRCILLA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	24226	24189	24003	23978	37247	37152	47706	47553	2514	2514	119643	119428	54213	54193	3379	3379	26392	26392	16487	16477	21713	21652
A2	73796	73740	36911	36888	16411	16292	31298	31288	2304	2304	52879	52695	51927	51902	25874	25836	58548	58525	31584	31536	5576	5576
A3	9895	9877	19945	19918	50361	50347	4925	4920	3392	3392	23798	23798	20431	20431	45045	45027	18878	18878	2451	2451	21876	21848
A4	179	179									398	398			38	38	560	560			367	367
A5	339	339	104	104	179	179	81	81			115	115	8	8	97	97	165	165	7	7	443	443
C1			54	54					200	200	57	57			1175	1175	814	814	113	113		
C3			18	18																		
D1			73	73	28	28					419	419	97	97							51	51
D2											213	213									26	26
D4	687	687	393	393	10293	10293	693	693			24505	24505	12999	12999	654	654	1085	1085	779	779	1315	1315
D5	96	96	25	25	14345	14345	215	215			9605	9605	14090	14090	414	414	257	257	59	59	218	218
D6			33	33	3670	3670					1458	1458	5003	5003	138	138	253	253			49	49
D7	3	3			325	325					441	441	200	200					1164	1164	1956	1956
D8	8	8	10	10							46	46	216	216					574	574	135	135
D9			7	7	54	54							184	184					78	78	55	55
E1																						
G1													8	8								
G2	559	768	675	779	1967	2215	231	409	2319	2357	2688	3139	2089	2134	159	272	530	561	4819	5417	682	771
G3	9	9	29	29															6	6		
H1																						
H2	254	254	3202	3196	5874	5874	1582	1577	460	460	5659	5641	11321	11321	574	535	1100	1100	2570	2570	446	446
H3			7	7																		
Total	110051	110149	85489	85512	140754	140774	86731	86736	11189	11227	241924	241958	172786	172786	77547	77565	108582	108590	60691	61231	54908	54908

Note: Blank cell indicates no apparent degradation

A2	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A3	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A4	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A5	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A6	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A7	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
B1	Wind erosion - Sheet - Slight	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B2	Wind erosion - Sheet - Moderate	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
		D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Telangana State

Area in hectares

LD Class	DISTRICTS																			
	RANGAREDDY		SANGAREDDY		SIDDIPET		SURYAPET		VIKARABAD		WANAPARTHY		WARANGAL (R)		WARANGAL (Ur)		YADADRI BHUVANAGIRI		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	23098	23083	20132	20118	33645	33467	13321	13030	10830	10815	41837	41809	5433	5433	8768	8756	11588	11524	759241	757721
A2	115868	115057	93872	93848	12698	12658	16019	15894	90208	90186	2042	2042	10265	10257	2959	2940	55065	54935	1388310	1385826
A3	17305	17305	7648	7610	10905	10905	14659	14659	18527	18527	3519	3519	2572	2572	3077	3077	8370	8339	715992	715512
A4	44	44					322	322											4524	4524
A5	30	30	61	61	271	271	4	4							70	70	80	80	15560	15517
C1																			2457	2457
C3																			42	42
D1	65	65					34	34	7	7					70	70			1077	1077
D2															10	10			425	425
D4	6147	6128	372	372	1045	1045	1384	1384	491	491	12597	12597	2887	2887	3589	3589	3884	3884	127155	127102
D5	3893	3893	163	163	739	739	1127	1127	256	256	7842	7842	629	629	451	451	2598	2598	67751	67751
D6	537	537			237	237	2526	2526	109	109	1847	1847	110	110	111	111	223	223	19834	19834
D7					644	644					17	17			174	174	13	13	8735	8735
D8	150	150			648	648							8	8	279	279	96	96	4361	4361
D9	83	83			66	66							12	12	3	3	14	14	1354	1354
E1									249	249									249	249
G1																			500	500
G2	2325	3220	593	818	1981	2476	2320	2955	1514	1755	1121	1149	565	583	1246	1277	2389	2620	41414	48280
G3																			75	75
H1																			13	13
H2	7227	7227	3473	3363	2177	2173	3006	3006	716	716	2936	2936	1486	1486	1397	1397	4572	4572	72146	71936
H3					16	16					2	2							130	130
Total	176772	176822	126314	126353	65072	65345	54722	54941	122907	123111	73760	73760	23967	23977	22204	22204	88892	88898	3231345	3233421

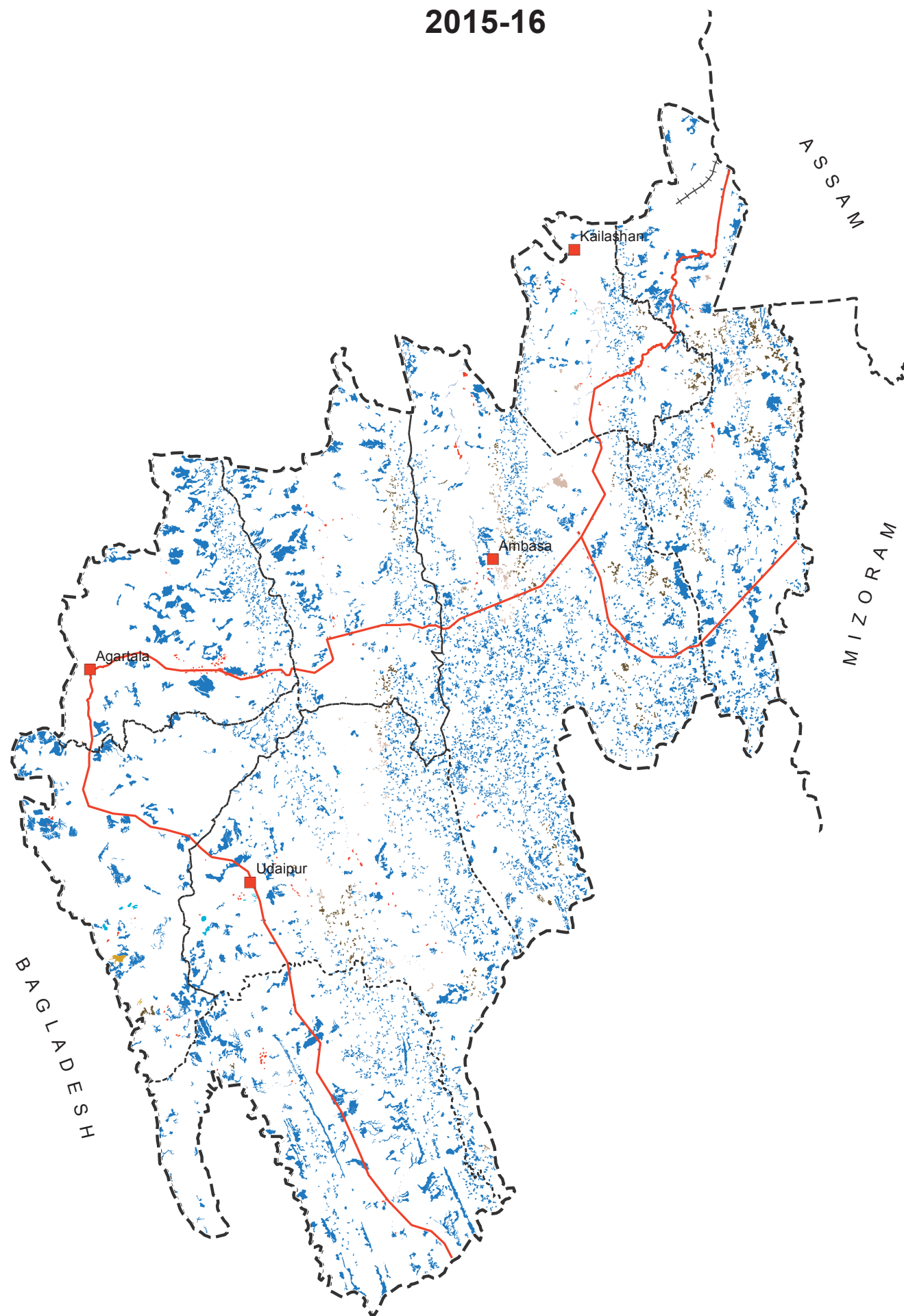
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Bhadradri Kothagudam District (382367ha, 46 % of district TGA)

Maximum changes in land degradation:-Peddapalle District (+540 ha, 0.02% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

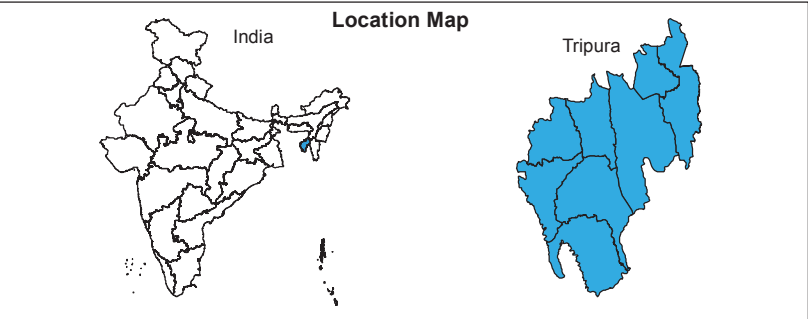
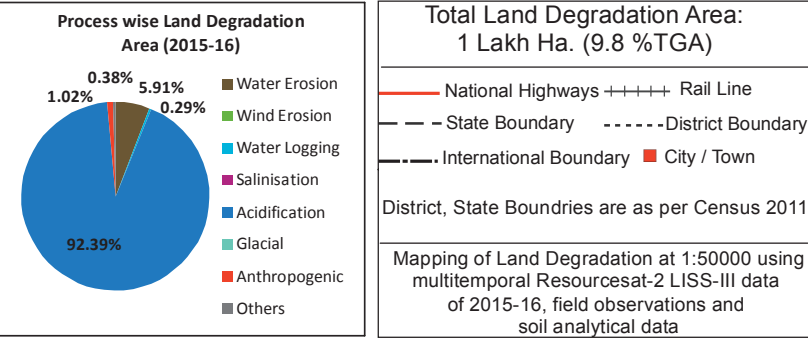
LAND DEGRADATION MAP OF TRIPURA
2015-16



ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND					
S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		1284
2		A2	Sheet erosion - Moderate		336
3		A3	Sheet erosion - Severe		4277
4		A4	Rills		179
5		A5	Gullies		
6		A6	Ravines-Shallow		
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		298
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		94906
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		1050
24		G2	Mining and dump areas		
25		G3	Brick kiln		
26	Others	H1	Mass movement / mass wastage		6
27		H2	Barren rocky / Stony waste		
28		H3	RiverineSands/Sea Ingress etc		

Note: White colour in map indicates either no apparent degradation or normal land.



Project Execution	Regional Coordination	Partner Institution(s)
Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	North Eastern Space Application Centre (NESAC), Umiyam-793103 (Meghalaya)	Tripura Space Applications Centre, Pandit Nehru Complex, AGARTALA – 799 006

Fig. 28

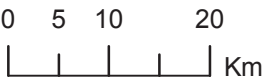
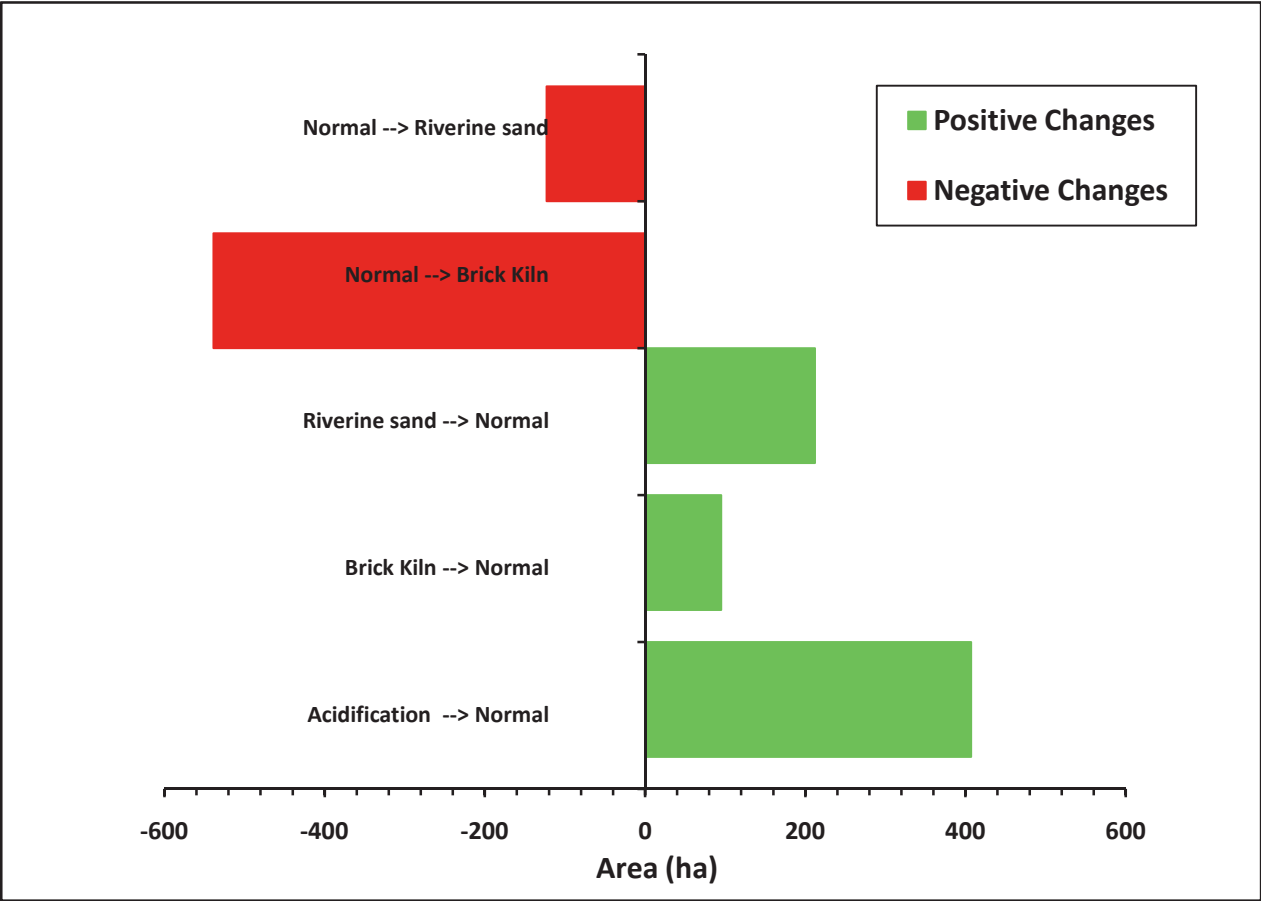


Table 59: Change matrix of land degradation classes in Tripura State
(during 2005-06 and 2015-16)

Area in hectares														
		2015-16												
	LD Class	A1	A2	A3	A5	C1	C2	E1	E2	G3	H1	H3	N	Class Total (2005-06)
2005-06	A1	1276												1276
	A2		326											326
	A3			4271										4271
	A5				179									179
	C1					282								282
	C2						13							13
	E1							88185		6			407	88598
	E2								6721					6721
	G3									505			95	600
	H3											263	212	475
	N	8	10	6		3				539	6	123		695
	Class Total (2015-16)	1284	336	4277	179	285	13	88185	6721	1050	6	386	714	
	Total LD area in 2015-16	102722												

Significant land degradation changes between 2005-06 and 2015-16



•Land degradation to Normal land : (-) 714 ha (0.69 %)
•Normal land to Land degradation: (+) 695 ha (0.68 %)
•Net decrease (-): 19 ha (0.02 %)
Percentage is w.r.t LD of Tripura State during 2005-06

Green Denotes Land degradation to Normal land
Red Denotes change from Normal land to Land degradation
Black Denotes no change in Land degradation class
Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 60: Category - wise distribution of land degradation in different districts of Tripura State

Area in hectares

LD Class	DISTRICTS																	
	DHALAI		GOMATI		KHOWAI		NORTH TRIPURA		SIPAHIJALA		SOUTH TRIPURA		UNOKOTI		WEST TRIPURA		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	541	541	382	382			196	196			2	2	155	163			1276	1284
A2	262	262	58	58				9					6	7			326	336
A3	1097	1097	639	639	425	425	1604	1610	121	121	43	43	342	342			4271	4277
A5									179	179							179	179
C1			140	140					117	117			25	28			282	285
C2			13	13													13	13
E1	23069	23037	10968	10942	7305	7169	15381	15379	6691	6685	12990	12784	3034	3034	9160	9155	88598	88185
E2	960	960	729	729	1298	1298	450	450	997	997	1367	1367			920	920	6721	6721
G3	73	200	106	160	45	84	19	94	73	98	29	100	49	70	206	244	600	1050
H1														6				6
H3	148	143		6	64	36	4	7	14	9	17	47	228	135		3	475	386
Total	26150	26240	13035	13069	9137	9012	17654	17745	8192	8206	14448	14343	3839	3785	10286	10322	102741	102722

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Dhalai District (26240 ha, 11 % of district TGA)

Maximum changes in land degradation:-Khowai District (-125 ha, 0.12% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF UTTAR PRADESH
2015-16

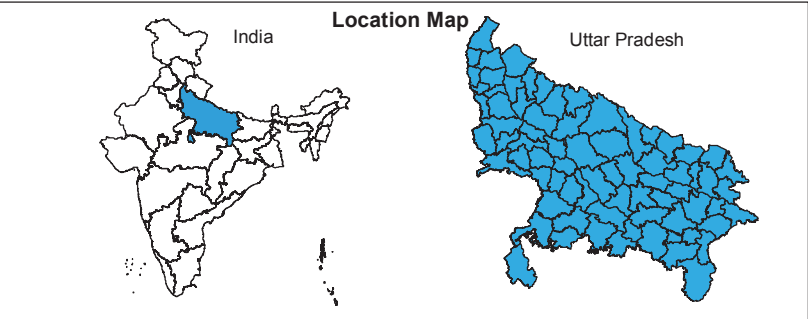
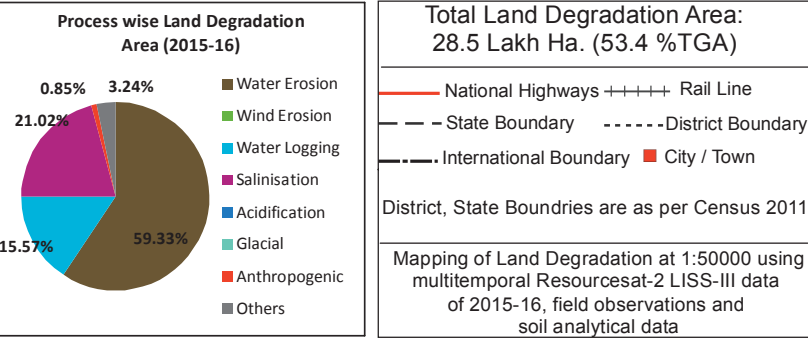


ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		225256
2		A2	Sheet erosion - Moderate		554917
3		A3	Sheet erosion - Severe		139527
4		A4	Rills		166124
5		A5	Gullies		373485
6		A6	Ravines-Shallow		87823
7		A7	Ravines-Deep		148373
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		393038
15		C3	Subsurface waterlogged		51928
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		103
17		D4-D6	Sodic - Slight/Moderate/Severe		62968
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		537559
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		130
24		G2	Mining and dump areas		9351
25		G3	Brick kiln		14819
26	Others	H1	Mass movement / mass wastage		10
27		H2	Barren rocky / Stony waste		59881
28		H3	RiverineSands/Sea Ingress etc		32618

Note: White colour in map indicates either no apparent degradation or normal land.



Area in hectares

2860299

•Land degradation to Normal land : (-) 4965 ha (0.17 %)	Green	Denotes Land degradation to Normal land
•Normal land to Land degradation: (+) 2576 ha (0.09 %)	Red	Denotes change from Normal land to Land degradation
•Net decrease (-) 2389 ha (0.08 %)	Black	Denotes no change in Land degradation class
# Percentage is w.r.t LD of Uttar Pradesh State during 2005-06	Blue	Denotes inter-class change

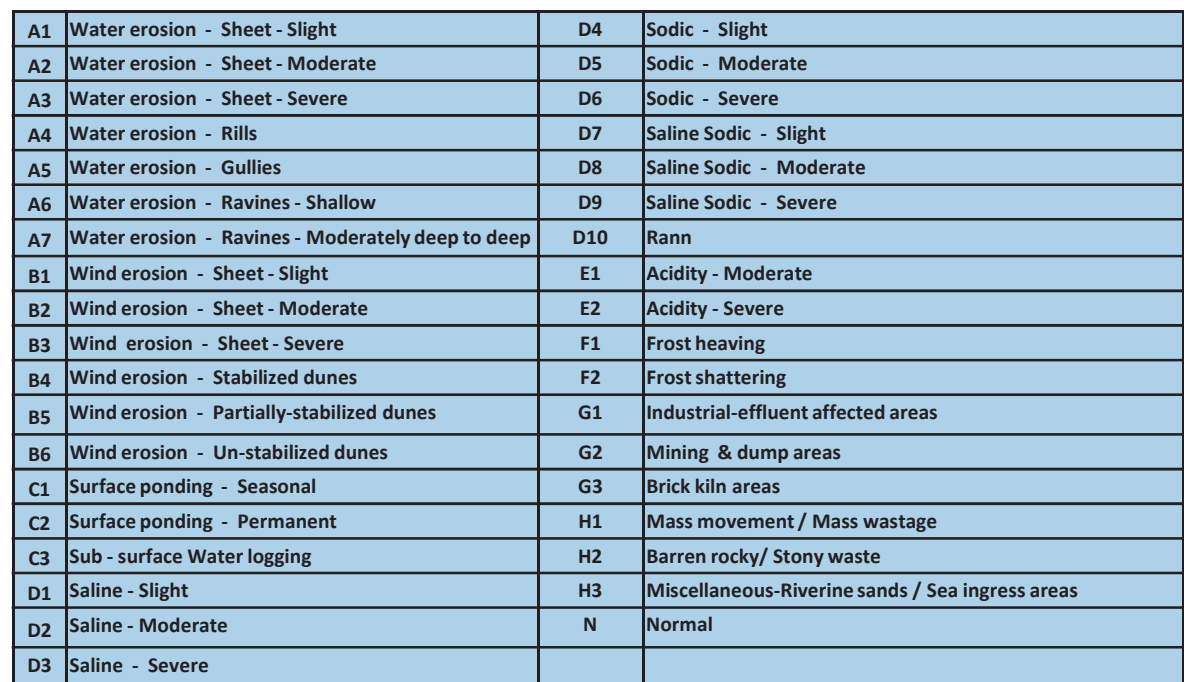


Table 62: Category - wise distribution of land degradation in different districts of Uttar Pradesh State

Area in hectares

LD Class	DISTRICTS																									
	AGRA		ALIGARH		ALLAHABAD		AMBEDKARNAGAR		AMETHI		AURAIYA		AZAMGARH		BADAUN		BAGHPAT		BAHRAICH		BALLIA		BALRAMPUR		BANDA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	5421	5421	1498	1498	7398	5858	375	366	590	587	1411	1411	1240	1474			192	192	575	575	275	275	1583	1583	2283	2283
A2	470	470			16668	16614					1042	1042	183	204											22220	22220
A3	1139	1139							3	3	1060	1060			865	865			532	532					3001	3001
A4	10287	10159			3867	3867			206	206	5866	5866	1127	1127	2058	2058							158	158	40024	40024
A5	9020	8974			23399	23399	1018	1015	9446	9446	3801	3801	642	642	4				4756	4711			148	148	37916	37916
A6	794	794			1379	1379			322	322			2	2											18025	18025
A7	41031	41031									3951	3951													608	608
C1	322	322	2368	2368	23272	23112	2143	2180	5957	5949	821	821	2272	2238	6579	6579	67	67	1490	1711	48407	48398	1263	1579	11	11
C2	477	477	2103	2103	518	518	35	11	153	149	89	89	3407	3423	17	17	19	19	441	219	673	673	944	590	2	2
C3	854	854	1	1	651	651					1820	1820			3064	3064										
D1																										
D2																										
D4	192	378									38	163			140	311										
D5	2035	1874									2029	1904			3624	3453										
D6	119	94									298	298			50	50										
D7	181	181		194	4540	4593	1684	1718	13784	13809	1406	1431	7270	7286							1947	1951			4	4
D8	494	494	5779	6035	3557	3533	1026	1145	9802	9801	6854	6824	7039	6959							3345	3345			20	20
D9	16	16	3925	3378	3343	3325	794	641	12265	12244	2316	2306	7684	7582							99	99		63		
G1					96	96							4	10												
G2					278	699			7	7															131	131
G3	59	59	217	217	179	179	82	110	223	223	102	102	909	1003	19	19	1005	1005	79	125	167	195	172	180		
H1																										
H2	833	833			8824	8696																			1016	1016
H3	30	30	220	220	50	50	64	64	165	165			313	57	1649	1649			80	80	10826	10896	153	153	29	29
Total	73774	73600	16111	16014	98019	96569	7221	7250	52923	52911	32904	32889	32092	32007	18069	18065	1283	1283	7953	7953	65739	65832	4421	4454	125290	125290

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Uttar Pradesh State

Area in hectares

LD Class	DISTRICTS																									
	BARA BANKI		BAREILLY		BASTI		BHIMNAGAR		BIJNOR		BULANDSHAHR		CHANDAULI		CHITRAKOOT		DEORIA		ETAH		ETAWAH		FAIZABAD		FARRUKHABAD	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	1535	1535			39	39	598	593	21788	21788	364	364	3565	3565	11611	11611	26	26			1074	1074	380	380	36	36
A2									136	136			44915	44904	43863	43849					389	304				
A3	267	267													18821	18821					2592	2592	520	520	111	111
A4	431	431	869	869			40	40	507	507	763	763			26508	26508			2791	2791	5370	5370	124	124	295	295
A5	6128	6125			172	172	24	24	1536	1536			51	50	8724	8721					11831	11831	4699	4699	1991	1677
A6													15	15	1459	1459					5176	5176	177	177		
A7																					27256	27256				
C1	2119	2213	7338	7338	2668	2692	1567	1567	1032	1032	4118	4118	223	455	1040	1040	868	988	2141	2141	1031	1031	2097	2170	15290	15279
C2	327	292	66	66	410	339	233	233	107	107	630	630	1076	821	8	22	302	172	3	33			38	48		
C3			62	62			2479	2479					22	22					3853	3853	1593	1593			263	263
D1													38	38			4	4								
D2																										
D4			94	114			699	736											39	39		28			68	103
D5			770	750			1535	1513											1140	1110	319	291			6574	6539
D6			7	7			43	28					3	3					81	81					828	828
D7	1700	1707			280	306						473	1761	1761	163	163	82	100	4024	4112	1619	1675	4076	4100	99	99
D8	3291	3291			47	47	116	116			2591	2451	283	283			30	22	8311	8311	6164	6134	2340	2565	1336	1336
D9	3253	3253					11	11			1861	1528	282	282					6194	6093	2275	2249	1811	1470	6	6
G1																										
G2																										
G3	98	101	15	15	36	36	167	172	94	94	252	252	80	95	4	4	35	38	48	48	34	34	157	157		
H1																										
H2													92	92	2324	2324										
H3	143	143	2945	2945	170	170	270	270			212	212	6	6			177	197	58	58					1485	1485
Total	19292	19358	12166	12166	3822	3801	7782	7782	25200	25200	10791	10791	52412	52392	114525	114522	1524	1547	28683	28670	66723	66638	16419	16410	28382	28057

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet – Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline – Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline – Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Uttar Pradesh State

Area in hectares

	DISTRICTS																									
LD Class	FATEHPUR		FIROZABAD		GAUTAMBUDH NAGAR		GHAZIABAD		GHAZIPUR		GONDA		GORAKHPUR		HAMIRPUR		HARDOI		HATHRAS		JALAUN		JAUNPUR		JHANSI	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	4582	4582	410	410	1101	1101	1198	1198	709	709	840	840	81	81	11569	11489	23	23	93	93	11491	11491	427	427	32746	32674
A2	6249	6249	9	9			60	60	10	10					38286	38286					14995	14995	5	5	48529	48173
A3	4924	4918	287	287					6	6					5142	5132					3700	3700	117	117	7678	7678
A4	4902	4902	3776	3764							4	4	1007	1007	3305	3305	1841	1841	4	4	2330	2330	4205	4205	960	960
A5	25249	25217	3255	3255									15	15	29810	29808	1899	1899	666	666	25855	25828	7623	7585	40806	40716
A6	3403	3403	251	251											13662	13662					15635	15635	48	48	11546	11546
A7	3063	3063	14408	14408											8454	8454					31037	31037			8042	8042
C1	2310	2300	1383	1383	1488	1488	165	165	27832	28091	1690	1765	839	657	99	99	35858	35549	794	794			5478	5493	7	7
C2	1118	958			267	267	51	49	426	241	219	144	90	90			67	67	45	45			273	271	9	9
C3			3223	3223													11164	11114					191	191		
D1	16	16							7	7																
D2																										
D4	17	17	52	119													806	920	12	12			11	11		
D5			924	857													14770	14690					21	21		
D6																	3410	3489								
D7	15400	15481	3287	3442					6915	6979	6	6	702	796	14	14			38	190			19704	20484		
D8	5093	5219	8203	8091	1081	1081			8938	8775			597	589	47	47	32	32	4825	4822			10894	10099		
D9	7184	7172	3261	3142	807	807			480	480	17	17	74	60			114	114	2763	2607			9103	9057		
G1															10	20										
G2					142	142									24	27									954	1428
G3	369	386	119	119	468	468	2713	2713	702	825	45	49	219	219	76	76	5	5	141	141	12	12	814	852		
H1																								10	10	
H2															48	48									10251	10075
H3	59	59							17	17	744	744	1741	1773	1	3	314	396							60	60
Total	83938	83942	42848	42760	5354	5354	4187	4185	46042	46140	3565	3569	5365	5287	110547	110470	70303	70139	9381	9374	105055	105028	58914	58866	161598	161378

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Uttar Pradesh State

Area in hectares

LD Class	DISTRICTS																							
	JYOTIBA PHULE NAGAR		KANNAUJ		KANPUR DEHAT		KANPUR NAGAR		KANSIRAMNAGAR		KAUSHAMBI		KHERI		KUSHINAGAR		LALITPUR		LUCKNOW		MAHARAJGANJ		MAHOBA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	4006	4006			2151	2151	1607	1607	172	172	337	337					21218	21143	59	59	975	975	11629	11434
A2					445	445	2973	2973	361	361	372	370					62937	62709					19113	18883
A3					3309	3309	4356	4356			1142	1142					7922	7922	109	109			2591	2580
A4	132	132	2552	2546	1183	1183	741	741	5732	5732	3809	3809	3523	3523					169	169	312	312	2792	2792
A5			1036	1031	16963	16963	10735	10735			3489	3489					1188	1188	384	384			6688	6688
A6					11926	11926	765	765															2468	2468
A7					9837	9837	257	257																
C1	2443	2443	3545	3545	9407	9407	7397	7397	11401	11425	450	443	32084	32084	3167	3315			526	562	1127	1161	36	36
C2	163	163	140	146	3778	3778	485	485	406	406	151	151	282	282	619	517			122	122	90	90	78	108
C3			796	796	44	44	24	24	6610	6610	135		7866	7866					15	15				
D1															3	3								
D2															35	35								
D4			409	409					287	438			239	276					48	48				
D5			708	702	117	117			2548	2377			3186	3133					156	156				
D6									193	189			17	33					42	42				
D7			1585	1652	7735	7892	2214	2306	428	428	2029	2029			308	320			4015	4015	168	168		
D8	807	807	11346	11279	7863	8131	2747	2969	957	959	2906	2871			13	13	31	31	1326	2002				
D9	14	14	1881	1870	12028	11603	8605	8247	143	141	1891	1887							9722	9010			6	6
G1																							4	4
G2																	512	603					716	1340
G3	66	66	12	12	6	6	79	79	302	302	440	443	156	156	41	43			2	2	27	27		
H1																								
H2															35	35	16224	16181					9650	9419
H3	106	106	22	22			21	21	1392	1392	32	32	1803	1803	5	5			27	27	3	3	38	47
Total	7737	7737	24032	24010	86792	86792	43006	42962	30932	30932	17183	17003	49156	49156	4226	4286	110032	109777	16722	16722	2702	2736	55809	55805

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Uttar Pradesh State

Area in hectares

LD Class	DISTRICTS																							
	MAINPURI		MATHURA		MAU		MEERUT		MIRZAPUR		MORADABAD		MUZAFFARNAGAR		PANCHSHIL NAGAR		PILIBHIT		PRABUDHNAGAR		PRATAPGARH		RAE BARELI	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	8	8	1346	1346	38	38	1102	1102	20552	20487	796	796	1554	1554	97	97			260	260	263	263	969	916
A2									102685	102388							129	129					17	17
A3	1	1	186	186					684	684														
A4	3883	3883	161	161					4942	4942					323	323	365	365			1052	1052	183	183
A5			1247	1247			1859	1859	5185	5185			4361	4361							18916	18911	6304	6304
A6									115	115														
A7									418	418											11	11		
C1	4012	4012	1778	1778	424	370	2793	2793	5820	5824	11	11	178	178	1041	1041	16160	16160	23	23	5677	5337	3546	3610
C2	201	201	1822	1822	109	109	107	107	36	36	15	15	3	3	112	109	112	112			182	161	151	151
C3	2269	2269			3	3											1240	1240			81	81		
D1																								
D2																								
D4		61															8	8						
D5	1826	1765	52	52													291	291						
D6			3	3																				
D7	8330	8394		174	3210	3264			151	151											21205	21577	13057	13093
D8	15391	15352	5159	5284	2784	2758			205	205					130	146			20	20	18473	18469	5457	5383
D9	4303	4250	2583	2174	602	577			37	37					49	33					14251	14251	10416	10304
G1																								
G2									1310	1668					55	55							12	19
G3	102	102	182	182	346	346	192	192	314	314	81	81	170	170	178	178			304	304	91	93	183	183
H1																								
H2			136	136					3869	3869														
H3	32	32															2686	2686						
Total	40358	40330	14655	14545	7516	7465	6053	6053	146323	146323	903	903	6266	6266	1985	1982	20991	20991	607	607	80202	80206	40295	40163

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of Uttar Pradesh State

Area in hectares

	DISTRICTS																										
LD Class	RAMPUR		SAHARANPUR		SANT KABIR NAGAR		SANT RAVI DAS NAGAR(BHADOHI)		SHAHJAHANPUR		SHRAWASTI		SIDDHARTH NAGAR		SITAPUR		SONBHADRA		SULTANPUR		UNNAO		VARANASI		Total		
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	
A1	642	642	5928	5928	138	124	37	37			42	42			718	718	20527	20527	423	419	380	380	36	36	227137	225256	
A2			12528	12528											92	92	116529	116481					11	11	556221	554917	
A3			741	741													67607	67517	177	177			54	54	139644	139527	
A4			8271	8271	34	34	1190	1190	443	443			37	37	308	308	40	40	238	238	3	3	227	227	166270	166124	
A5			4126	4126			434	434			161	161			5757	5757	15832	15832	7887	7880	146	146	931	928	374113	373485	
A6			465	465															190	190					87823	87823	
A7																										148373	148373
C1	72	72	41	41	1367	1413	2596	2661	19349	19254	2230	2234	2583	2244	1195	1195	656	656	2921	2861	4727	4727	1441	1574	366671	367077	
C2			9	9	140	41	145	212	142	142	1529	1184	32		722	722			428	415	651	651	324	317	27929	25961	
C3							44	44	3671	3671									9	9	66	66			52113	51928	
D1																										68	68
D2																										35	35
D4									58	69					1328	1460										4545	5720
D5									3035	3024					5130	5050					156	156				50946	49825
D6									99	99					2141	2089			22	22	68	68				7424	7423
D7					325	344	2403	2356				8	231	602	717	717			8792	8917	9092	9140	4035	4132	180716	184734	
D8	71	71			174	174	1284	1256							838	838			4785	4772	3489	3984	2340	2103	190731	191344	
D9							1673	1636							430	430			3967	3911	23222	22679	452	419	166213	161481	
G1																										114	130
G2																	1832	3232								5973	9351
G3	31	31	19	19	68	108	290	369	49	49			2	6			29	29	168	178			421	421	14267	14819	
H1																										10	10
H2																	7157	7157								60459	59881
H3			13	13	62	66			3370	3452	29	98	116	116	41	41	463	463	29	29	99	99	134	134	32504	32618	
Total	816	816	32141	32141	2308	2304	10096	10195	30216	30203	3991	3727	3001	3005	19417	19417	230672	231934	30036	30018	42099	42099	10406	10356	2860299	2857910	

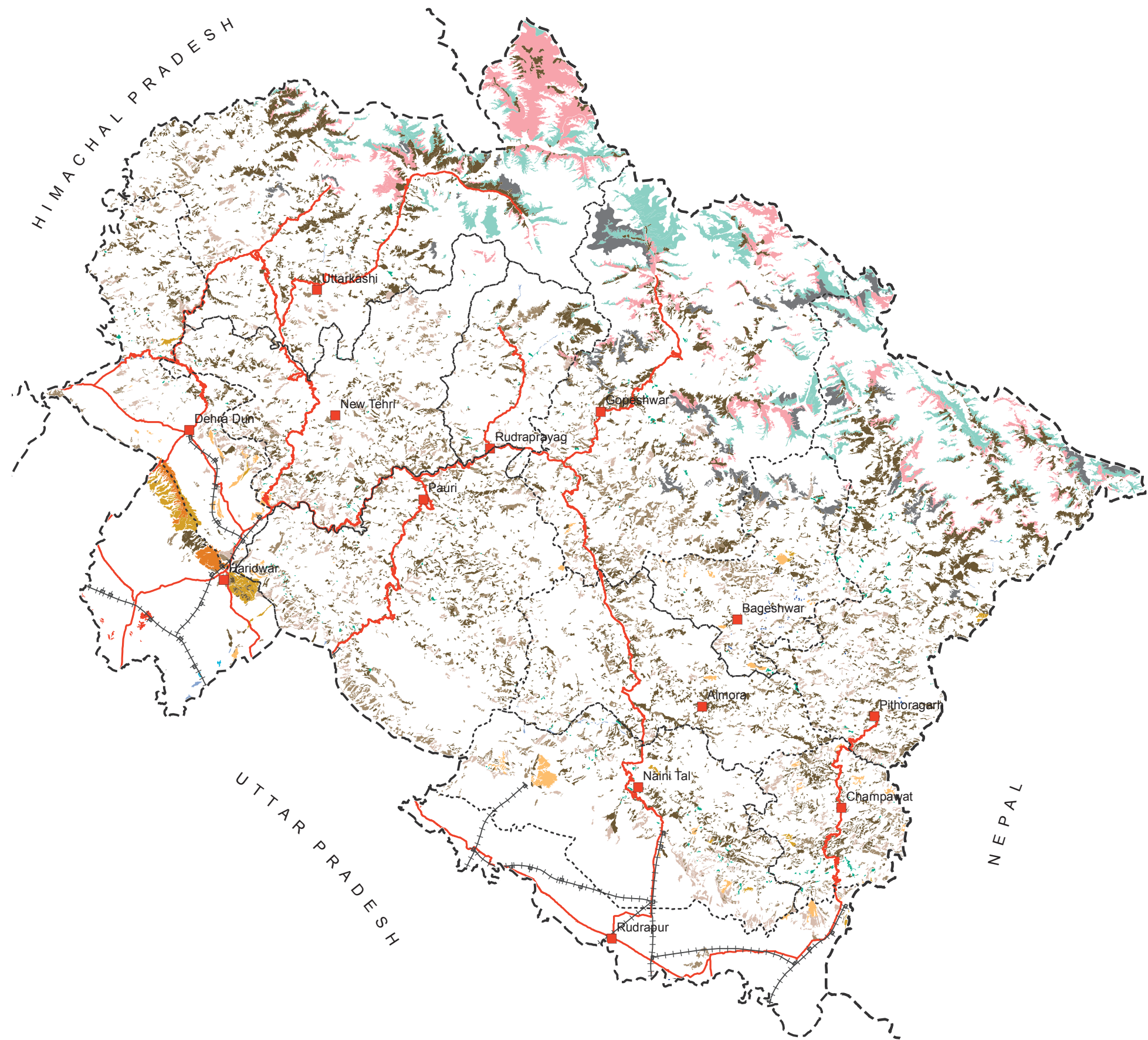
Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Sonbhadra District (231934 ha, 34% of district TGA)

Maximum changes in land degradation:-Allahabad District (-1450 ha, 0.05% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF UTTARAKHAND
2015-16



ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND					
S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		88278
2		A2	Sheet erosion - Moderate		127297
3		A3	Sheet erosion - Severe		366189
4		A4	Rills		15652
5		A5	Gullies		15602
6		A6	Ravines-Shallow		8780
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		188
15		C3	Subsurface waterlogged		
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic – Moderate/Severe		
21	Glacial	F1	Frost heaving		121976
22		F2	Frost Shattering		124800
23	Anthropogenic	G1	Industrial effluent affected areas		
24		G2	Mining and dump areas		523
25		G3	Brick kiln		1517
26	Others	H1	Mass movement / mass wastage		8970
27		H2	Barren rocky / Stony waste		63745
28		H3	RiverineSands/Sea Ingress etc		2016

Note: White colour in map indicates either no apparent degradation or normal land.

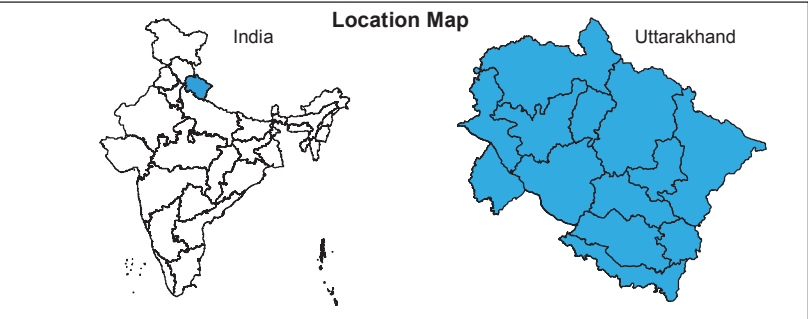
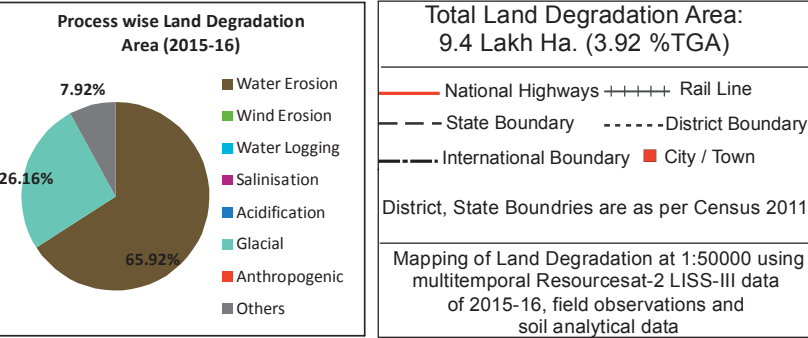
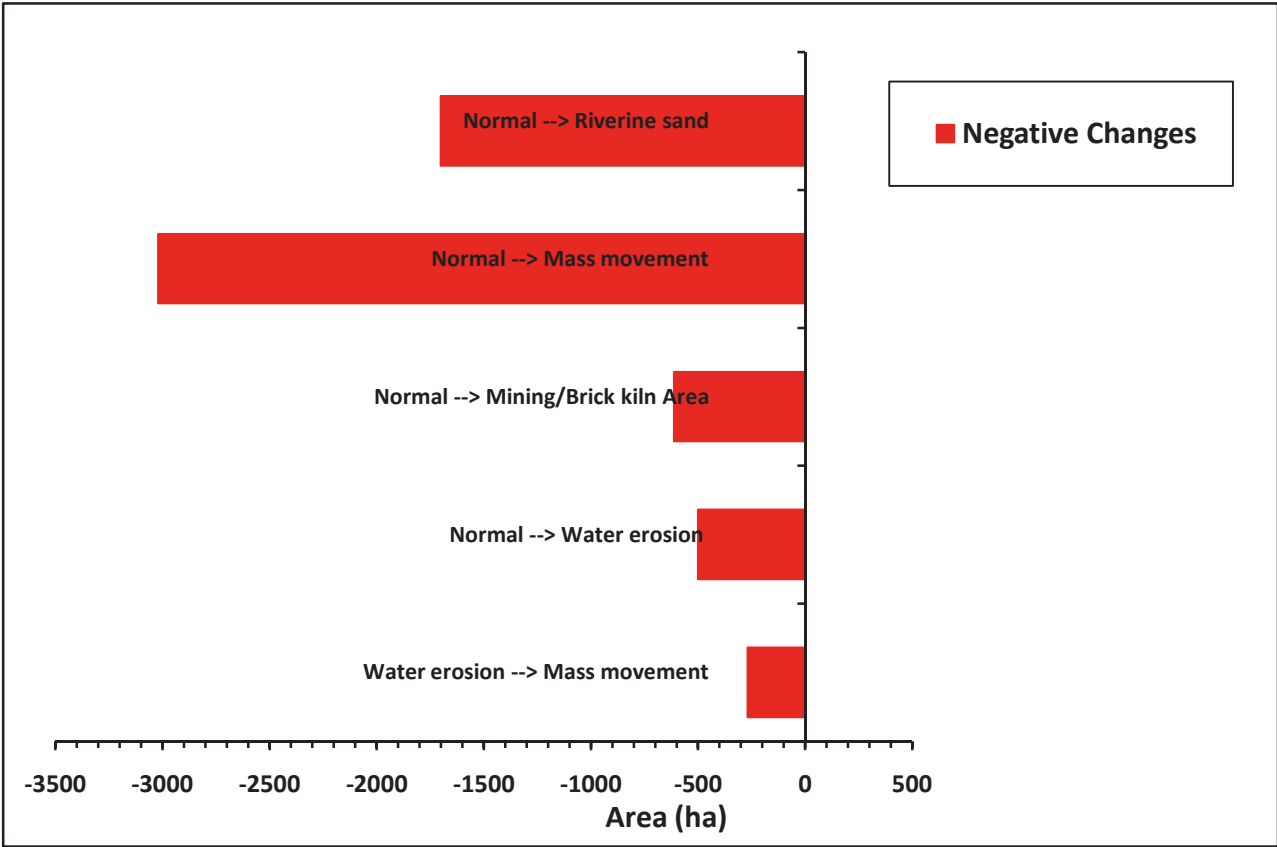


Table 63: Change matrix of land degradation classes in Uttarakhand State
(during 2005-06 and 2015-16)

Area in hectares																	
		2015-16															
	LD Class	A1	A2	A3	A4	A5	A6	C1	C2	F1	F2	G2	G3	H1	H2	H3	Class Total (2005-06)
2005-06	A1	88278												5			88283
	A2		127065											48			127113
	A3			365921								18		216			366155
	A4				15652												15652
	A5					15602											15602
	A6						8780										8780
	C1							3									3
	C2								185								185
	F1									121976							121976
	F2										124800						124800
	G2											324					324
	G3												1085				1085
	H1													5681			5681
	H2														63745		63745
	H3															315	315
	N		232	268								181	432	3020		1701	5834
	Class Total (2015-16)	88278	127297	366189	15652	15602	8780	3	185	121976	124800	523	1517	8970	63745	2016	
	Total LD area in 2015-16	945533															

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 0 ha (0 %)				Green Denotes Land degradation to Normal land			
*Normal land to Land degradation: (+) 5834 ha (0.62 %)				Red Denotes change from Normal land to Land degradation			
*Net increase (+) 5834 ha (0.62 %)				Black Denotes no change in Land degradation class			
# Percentage is w.r.t LD of Uttarakhand State during 2005-06				Blue Denotes inter-class change			
A1	Water erosion - Sheet - Slight	D4	Sodic - Slight				
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate				
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe				
A4	Water erosion - Rills	D7	Saline Sodic - Slight				
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate				
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe				
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann				
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate				
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe				
B3	Wind erosion - Sheet - Severe	F1	Frost heaving				
B4	Wind erosion - Stabilized dunes	F2	Frost shattering				
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas				
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas				
C1	Surface ponding - Seasonal	G3	Brick kiln areas				
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage				
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste				
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas				
D2	Saline - Moderate	N	Normal				
D3	Saline - Severe						

Table 64: Category - wise distribution of land degradation in different districts of Uttarakhand State

Area in hectares

	DISTRICTS																											
LD Class	ALMORA		BAGESHWAR		CHAMOLI		CHAMPAWAT		DEHRA DUN		GARHWAL		HARIDWAR		NAINI TAL		PITHORAGARH		RUDRAPRAYAG		TEHRI GARHWAL		UDHAM SINGH NAGAR		UTTARKASHI		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	3471	3466	4516	4516	5302	5302	5651	5651	9743	9743	10786	10786	349	349	12072	12072	8880	8880	2925	2925	14308	14308	2310	2310	7970	7970	88283	88278
A2	11051	11051	9834	9834	22646	22621	6189	6277	9312	9348	24791	24778	1748	1798	6684	6684	7438	7438	4773	4773	13363	13407	1779	1783	7505	7505	127113	127297
A3	25432	25455	13479	13460	48155	48136	16133	16133	12269	12343	32112	32112	3749	3749	21888	21905	81220	81235	12974	12961	22391	22367			76353	76333	366155	366189
A4	367	367	2012	2012	256	256	1621	1621	3100	3100	759	759	474	474	5046	5046					707	707	1310	1310			15652	15652
A5			302	302			499	499	2392	2392	261	261	10620	10620	623	623	526	526					379	379			15602	15602
A6									1746	1746			7034	7034													8780	8780
C1																							3	3			3	3
C2													185	185													185	185
F1			163	163	31261	31261											24136	24136	552	552	694	694			65170	65170	121976	121976
F2			734	734	48919	48919											37205	37205	468	468					37474	37474	124800	124800
G2			244	393					24	24						4	56	85						17			324	523
G3									40	40			940	1348									105	129			1085	1517
H1	58	273	425	635	799	1180	841	916	463	547	496	743			1087	1245	718	1817	162	428	193	565			439	621	5681	8970
H2			5741	5741	34204	34204											17392	17392	65	65	82	82			6261	6261	63745	63745
H3	14	76				123			117	219	92	150		481		305	42	180	20	311	12	67	18	18		86	315	2016
Total	40393	40688	37450	37790	191542	192002	30934	31097	39206	39502	69297	69589	25099	26038	47400	47884	177613	178894	21939	22483	51750	52197	5904	5949	201172	201420	939699	945533

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Uttarkashi District (201420 ha, 25% of district TGA)

Maximum changes in land degradation:-Pithoragarh District (+1281 ha, 0.14% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

LAND DEGRADATION MAP OF WEST BENGAL
2015-16

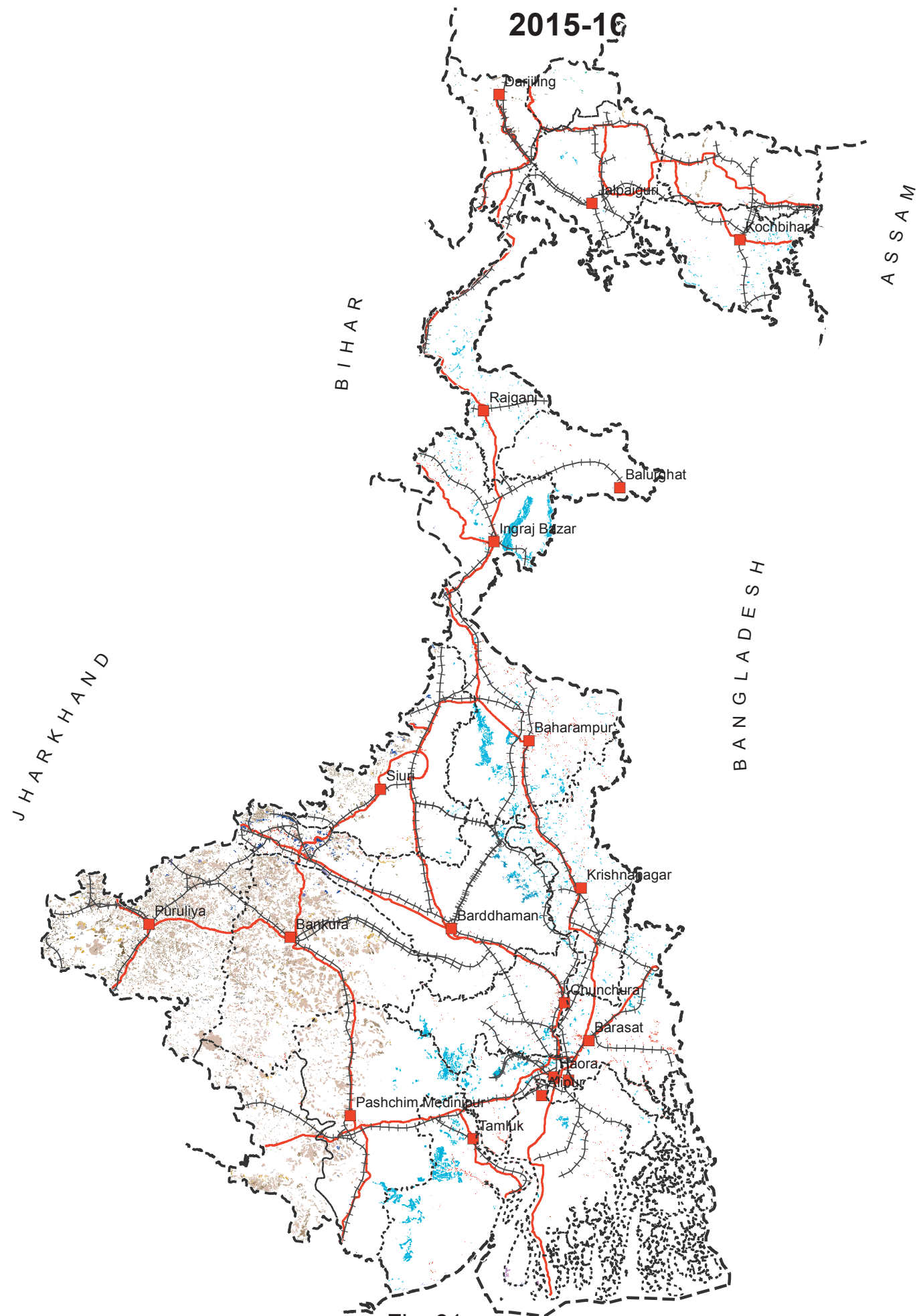
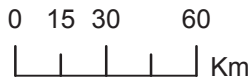


Fig. 31

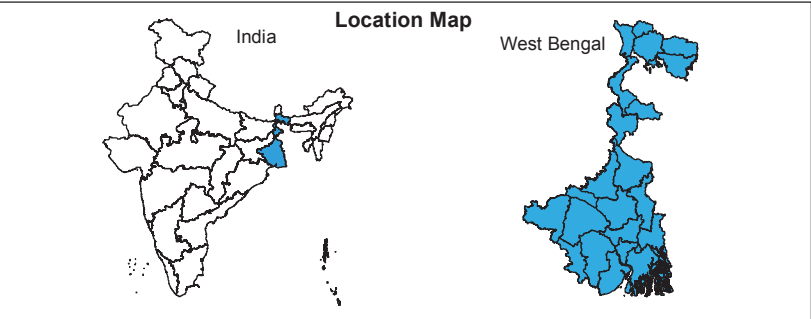
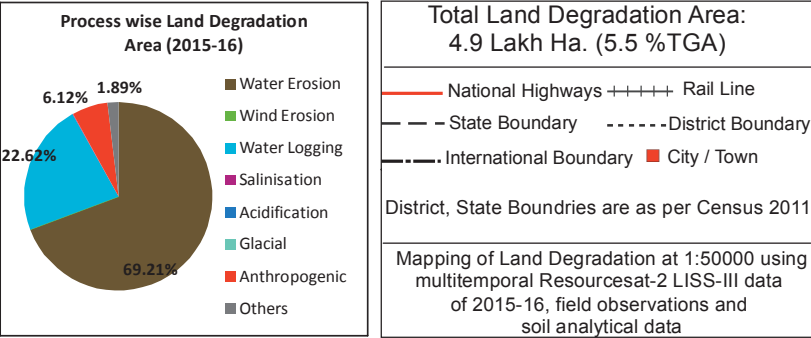


ISRO- NNRMS- NATURAL RESOURCES CENSUS PROGRAM

LEGEND

S.No	Process	Code	Land Degradation Class	Symbol	Area Ha.
1	Water Erosion	A1	Sheet erosion - Slight		189507
2		A2	Sheet erosion - Moderate		130125
3		A3	Sheet erosion - Severe		11248
4		A4	Rills		9
5		A5	Gullies		10417
6		A6	Ravines-Shallow		278
7		A7	Ravines-Deep		
8	Wind Erosion	B1	Sheet erosion - Slight		
9		B2	Sheet erosion - Moderate		
10		B3	Sheet erosion - Severe		
11		B4	Stablized Dunes		
12		B5	Partially Stablized Dunes		
13		B6	Un-Stablized Dunes		
14	Water logging	C1/C2	Surface ponding - Seasonal/Permanent		107947
15		C3	Subsurface waterlogged		3710
16	Salinisation / Alkalisation	D1-D3	Saline - Slight/Moderate/Severe		753
17		D4-D6	Sodic - Slight/Moderate/Severe		
18		D7-D9	Saline Sodic - Slight/Moderate/Severe		
19		D10	Rann		
20	Acidification	E1/E2	Acidic - Moderate/Severe		
21	Glacial	F1	Frost heaving		
22		F2	Frost Shattering		
23	Anthropogenic	G1	Industrial effluent affected areas		2861
24		G2	Mining and dump areas		11139
25		G3	Brick kiln		16219
26	Others	H1	Mass movement / mass wastage		363
27		H2	Barren rocky / Stony waste		6833
28		H3	RiverineSands/Sea Ingress etc		2131

Note: White colour in map indicates either no apparent degradation or normal land.



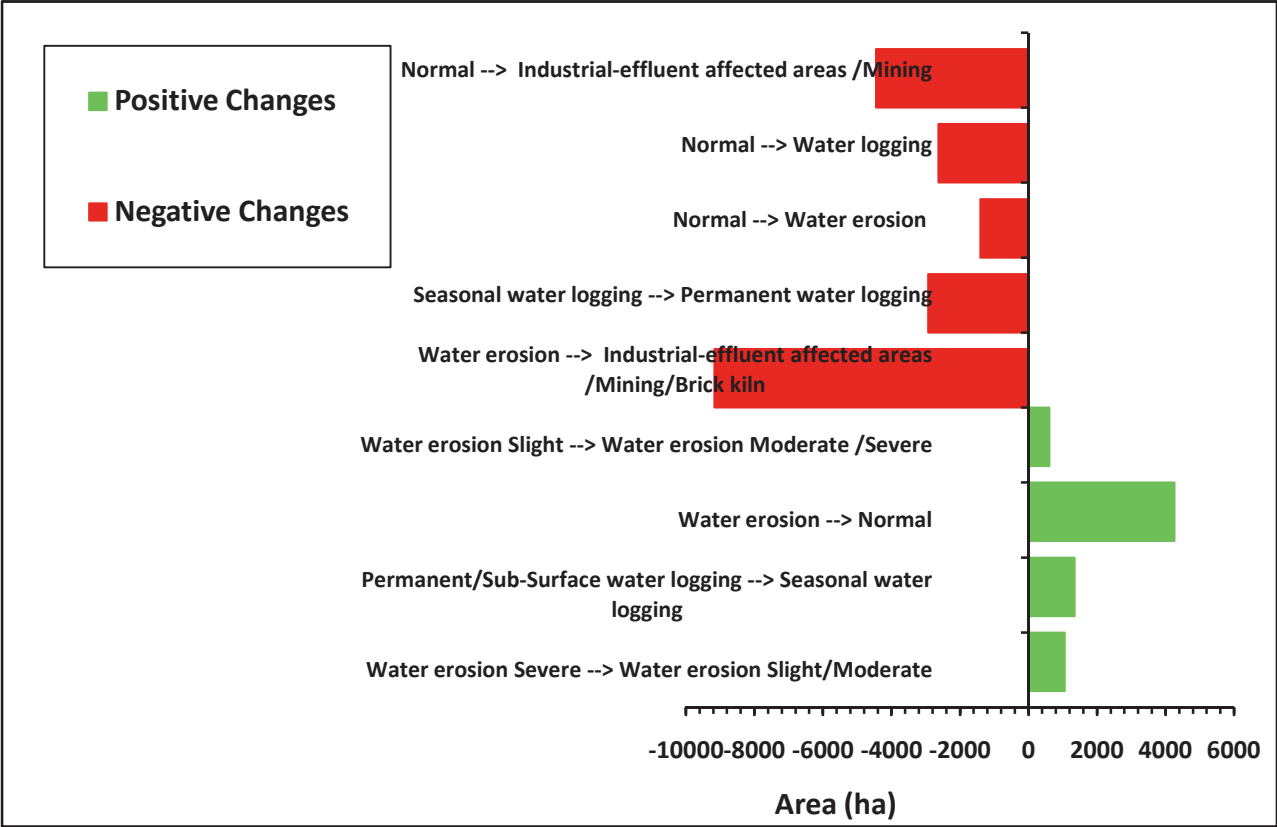
Project Execution Soils and Land Resources Assessment Division, LRUMG, RSA-A, National Remote Sensing Centre, ISRO, Dept. of Space, Govt. of India Hyderabad-500037	Regional Coordination Regional Remote Sensing Centre – East, Jyoti Basu Nagar, Kolkata-700156	Partner Institution(s) Department of Sci. & Tech., Bikash Bhavan, Salt Lake, Kolkata – 700091
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Table 65: Change matrix of land degradation classes in West Bengal State
(during 2005-06 and 2015-16)

Area in hectares

		2015-16																			Class Total (2005-06)	Total LD area in 2005- 06
	LD Class	A1	A2	A3	A4	A5	A7	C1	C2	C3	D1	D2	D3	G1	G2	G3	H1	H2	H3	N		
2005-06	A1	188563	6	605											29	9				735	189947	489470
	A2		129950	9										48	255	8790	293			3358	142703	
	A3	891	166	9229											23	4	2			130	10445	
	A4				9																9	
	A5	48				10417										7				42	10514	
	A7						278														278	
	C1							95499	2931							29				12	98471	
	C2							1340	5538					16		32					6926	
	C3							11		3710											3721	
	D1										312										312	
	D2											25									25	
	D3												416								416	
	G1													1329							1329	
	G2													167	7672						7839	
	G3	5	3													7348				84	7440	
	H1																68			52	120	
	H2														11			6833			6844	
	H3																		2131		2131	
	N			1405					2628					1301	3149						8483	
	Class Total(2015-16)	189507	130125	11248	9	10417	278	96850	11097	3710	312	25	416	2861	11139	16219	363	6833	2131	4413		
	Total LD area in 2015- 16	493540																				

Significant land degradation changes between 2005-06 and 2015-16



*Land degradation to Normal land : (-) 4413 ha (0.90 %)
 Green Denotes Land degradation to Normal land

*Normal land to Land degradation: (+) 8483 ha (1.73 %)
 Red Denotes change from Normal land to Land degradation

*Net increase(+) 4070 ha (0.83%)
 Black Denotes no change in Land degradation class

Percentage is w.r.t LD of West Bengal State during 2005-06
 Blue Denotes inter-class change

A1	Water erosion - Sheet - Slight	D4	Sodic - Slight
A2	Water erosion - Sheet - Moderate	D5	Sodic - Moderate
A3	Water erosion - Sheet - Severe	D6	Sodic - Severe
A4	Water erosion - Rills	D7	Saline Sodic - Slight
A5	Water erosion - Gullies	D8	Saline Sodic - Moderate
A6	Water erosion - Ravines - Shallow	D9	Saline Sodic - Severe
A7	Water erosion - Ravines - Moderately deep to deep	D10	Rann
B1	Wind erosion - Sheet - Slight	E1	Acidity - Moderate
B2	Wind erosion - Sheet - Moderate	E2	Acidity - Severe
B3	Wind erosion - Sheet - Severe	F1	Frost heaving
B4	Wind erosion - Stabilized dunes	F2	Frost shattering
B5	Wind erosion - Partially-stabilized dunes	G1	Industrial-effluent affected areas
B6	Wind erosion - Un-stabilized dunes	G2	Mining & dump areas
C1	Surface ponding - Seasonal	G3	Brick kiln areas
C2	Surface ponding - Permanent	H1	Mass movement / Mass wastage
C3	Sub - surface Water logging	H2	Barren rocky/ Stony waste
D1	Saline - Slight	H3	Miscellaneous-Riverine sands / Sea ingress areas
D2	Saline - Moderate	N	Normal
D3	Saline - Severe		

Table 66: Category - wise distribution of land degradation in different districts of West Bengal State

Area in hectares

LD Class	DISTRICTS																							
	ALIPURDUAR		BANKURA		BIRBHUM		DAKSHIN DINAJPUR		DARJILING		HAORA		HUGLI		JALPAIGURI		JHARGRAM		KALIMPONG		KOCHBIHAR		KOLKATA	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	233	233	83976	83443	2382	2355	42	42	129	253			197	197	94	94	29922	29813	13	19				
A2	1586	1576	41517	39890	9088	8047	345		970	978	325		127		74	71	13182	13107	313	116	18			
A3			646	847	361	354			491	507							480	629	56	50				
A4			9	9																				
A5			4373	4340	338	338									134	134	1626	1626						
A7																								
C1	56	56			1209	1209	400	400			4250	4165	7784	7591	252	252					4005	4005		
C2	7	7			33	33					1472	2324	1214	2060	291	291					54	54		
C3																								
D1																								
D2																								
D3																								
G1			294	372	93	192							29	45										
G2			399	1211	1361	2055							14	123			117	122						
G3	100	100	241	562	112	174		345			709	1015	545	644		3	20	164			127	145		
H1	68	78							42	88									10	197				
H2			1555	1544	86	86											240	240						
H3	55	55	318	318	123	123									144	144	237	237	10	10	7	7		
Total	2105	2105	133328	132536	15186	14966	787	787	1632	1826	6756	7504	9910	10660	989	989	45824	45938	402	392	4211	4211		

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Contd...

Category - wise distribution of land degradation in different districts of West Bengal State

Area in hectares

	DISTRICTS																							
LD Class	MALDAH		MURSHIDABAD		NADIA		NORTH 24 PARGANAS		PASCHIM BARDHAMAN		PASHCHIM MEDINIPUR		PURBA BARDDHAMAN		PURBA MEDINIPUR		PURULIYA		SOUTH 24 PARGANAS		WEST DINAJPUR		Total	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1									4073	4075	26136	26075	27	27			42710	42868			13	13	189947	189507
A2	503		1595	63	1081		1556		8702	7693	6739	6349	424	181	642		53334	52054	256		326		142703	130125
A3									496	505							7915	8356					10445	11248
A4																							9	9
A5									6	6	497	481	299	299			3241	3193					10514	10417
A7											278	278											278	278
C1	19948	18664	18523	18872	4802	4801	2636	2579			5887	5660	3490	3501	19987	20012			1515	1515	3727	3568	98471	96850
C2	969	2226	349		194	194	679	839			1070	2178			527	470			64	156	3	265	6926	11097
C3	12	12												3679	3668						30	30	3721	3710
D1																			312	312			312	312
D2																			25	25			25	25
D3																			416	416			416	416
G1			507	673					230	995				41	90	90	86	453					1329	2861
G2									5349	6578	283	448	15	52			301	550					7839	11139
G3	127	650	615	2144		1082	2175	3713	1022	1964	4	255	3	246	819	1489	23	144	798	1054		326	7440	16219
H1																							120	363
H2											153	153					4810	4810					6844	6833
H3	60	60	42	42	189	189	29	29	52	52	18	18	10	10	348	348	70	70	419	419			2131	2131
Total	21619	21612	21631	21794	6266	6266	7075	7160	19930	21868	41065	41895	7947	8025	22413	22409	112490	112498	3805	3897	4099	4202	489470	493540

Note: Blank cell indicates no apparent degradation

Maximum land degradation (2015-16) was observed in Bankura District (132536 ha, 19.3% of district TGA)

Maximum changes in land degradation:-Paschim Bardhaman District (+1938 ha, 0.4% of Total LD Area in 2005-06)

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Severe	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas

Table. 67 Category - wise distribution of land degradation in different districts of Delhi and union territories

Area in hectares

	DISTRICTS															
LD Class	ANDAMAN & NICOBAR		CHANDIGARH		DADRA NAGAR HAVELI		DAMAN AND DIU		DELHI		LAKSHADWEEP		PUDUCHERRY		TOTAL	
	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16	05-06	15-16
A1	47142	46779	38	38	5818	5802	422	329	830	621	5		86	16	54341	53587
A2	609	609	19	19					4371	4580					4999	5208
A3									83	83					83	83
A5									813	813					813	813
C1					28	28	364	364							392	392
C3													3	3	3	3
D1													1276	1188	1276	1188
D7													136	138	136	138
G2	161	191					133	133	21	21					315	345
H2									1179	1179					1179	1179
H3	5349	5349					41	41			42	42	303	303	5735	5735
Total	53261	52928	57	57	5846	5830	960	867	7298	7298	47	42	1804	1649	69272	68672

Note: Blank cell indicates no apparent degradation

A1	Water erosion - Sheet - Slight	B3	Wind erosion - Sheet - Severe	D3	Saline - Severe	E2	Acidity - Severe
A2	Water erosion - Sheet - Moderate	B4	Wind erosion - Stabilized dunes	D4	Sodic - Slight	F1	Frost heaving
A3	Water erosion - Sheet - Sever	B5	Wind erosion - Partially-stabilized dunes	D5	Sodic - Moderate	F2	Frost shattering
A4	Water erosion - Rills	B6	Wind erosion - Un-stabilized dunes	D6	Sodic - Severe	G1	Industrial-effluent affected areas
A5	Water erosion - Gullies	C1	Surface ponding - Seasonal	D7	Saline Sodic - Slight	G2	Mining & dump areas
A6	Water erosion - Ravines - Shallow	C2	Surface ponding - Permanent	D8	Saline Sodic - Moderate	G3	Brick kiln areas
A7	Water erosion - Ravines - Moderately deep to deep	C3	Sub - surface Water logging	D9	Saline Sodic - Severe	H1	Mass movement / Mass wastage
B1	Wind erosion - Sheet - Slight	D1	Saline - Slight	D10	Rann	H2	Barren rocky/ Stony waste
B2	Wind erosion - Sheet - Moderate	D2	Saline - Moderate	E1	Acidity - Moderate	H3	Miscellaneous-Riverine sands / Sea ingress areas